U. S. DEPARTMENT OF AGRICULTURE

OFFICE OF EXPERIMENT STATIONS

EXPERIMENT STATION RECORD

VOLUME 55

JULY–DECEMBER, 1926

1222
26 MAY 1936

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON
1927

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EXPERIMENT STATION RECORD

Vol. 55 JULY, 1926 No. 1

Of the many and varied movements of the present century for the betterment of American agriculture, perhaps none has been of greater practical significance or more far-reaching in its influence than the development of agricultural extension work. Under its ministrations the results of a well-organized and productive system of research institutions have been carried directly to the farmer and his family on a scale never before attempted and with an effectiveness which is quite remarkable.

Starting more or less informally and sporadically, the orderly growth and progress of agricultural extension has been particularly rapid since its formal recognition and development by the Federal Government under the Smith-Lever Act of 1914. A recently published report by the Office of Cooperative Extension Work is devoted especially to a review of the operations under this act during the first decade following its passage. This review has summarized the principal achievements of the period, and has thereby directed attention to the wide influence which the service exerted during some of the most important years in our agricultural history.

As the report points out, when the Smith-Lever Act went into effect the land-grant colleges were already conducting considerable extension work with their own funds. Likewise, the Federal Department of Agriculture was expending nearly a million dollars per annum for extension work independently of the colleges. The act required cooperation between these institutions in part of the extension work, and under a plan proposed by the Secretary of Agriculture and accepted by the colleges there was brought about a voluntary pooling of all funds available for the various States and the carrying on of the work by a single extension division organized at the college and headed by a director appointed by the college with the assent of the Secretary of Agriculture. Thus there was instituted immediately a new principle in Federal and State cooperation and the creation of a unified system through which all extension work of the colleges and the department is being conducted, with results which are apparently satisfactory to both the States and the Federal Government.

Not only have the States and the Nation thus been in partnership in carrying on extension work, but the farmers and farm women themselves have been active participants. Under the plan followed, the agents of the cooperating county, State, and Federal Governments and the people of each farming community where extension work has been carried on have together made analyses of local conditions and agreed upon what ought to be done, and, when an understanding has been reached, the administration of the work has been entrusted to the State college of agriculture. This is another remarkable achievement in practical cooperation, and as the report puts it, "that farmers and farm women have been made essentially partners with the Government, sitting down with the Government agents around a common council table and together working out plans for extension work in the community looking toward the improvement of the farm, the home, and the neighborhood may be regarded as one of the outstanding accomplishments of extension during its first 10-year period under the Smith-Lever Act."

Another direction in which marked success is claimed is in the broadening of the outlook of the farmer and farm woman. The extension work of the decade under review has contributed powerfully to the improvement of technical efficiency, but it has also brought a consciousness of a need for seeing the larger things of the community and the State. It has expanded the interests and vision of farm people, "making them partners with Government in the larger as well as the smaller things of the farm, the home, the community, and the State."

A measure of the popular appreciation of the extension enterprise is afforded by some of the comparative data which are now available. When the Smith-Lever Act went into effect on July 1, 1914, the State and Federal Governments were spending approximately $1,600,000 for carrying on various lines of extension work in agriculture and home economics. In 1924 the amount had increased to $19,394,639 per annum, of which about 38 per cent came from Federal sources, 27 per cent from State sources, and 35 per cent from the counties. The States and counties were contributing nearly $12,000,000, as compared with about $600,000 ten years before. Thus within the space of 10 years the Federal Government had increased its appropriation sevenfold and the States and counties twentyfold.

The increase in appropriations has naturally been accompanied by a large development of personnel. In 1914 there were 881 county agricultural agents and 349 home demonstration agents. In 1924 the county agricultural agents numbered 2,251, with 89 assistant agents, and the county home demonstration agents 946, with 18 assistant agents. From a large preponderance in the Southern States, the county agents had become widely distributed and the home

demonstration movement had gained much headway in the Eastern States. Including an equivalent of 765 full-time specialists and extension directors and other supervisory officers, the total extension personnel aggregated 4,764 people.

This increase, however, had been by no means a mere matter of numbers. Full-time specialists, particularly in home demonstration, had replaced many part-time workers, and men and women with professional training had been employed in increasing numbers to meet the demand for as well qualified a staff as could be obtained. By 1924 about 90 per cent of the agents employed had been educated in an agricultural college or similar institution, in addition to their practical experience, and such training had come to be regarded as practically a requisite in the employment of new agents. Likewise the viewpoint had changed. In the recent words of one who has grown up with the extension service, the modern county agent has become " less a personal apostle with a message and more the representative of the State college of agriculture and the United States Department of Agriculture. He is less an opportunist and more an analyst, who helps the farmer determine what is best, demonstrates better practices, and advertises the results. His advance from the pioneer type has been rapid. It is due partly to mechanical conveniences and organization, partly to better training, but primarily to better understanding and cooperation by the farmers, who are in themselves the best fruits of extension work."

Much of the success of the extension movement is freely attributed to the large army of farm men and women who have from the beginning voluntarily joined with the paid extension forces in their efforts to improve farm and home practices. It is announced that in 1924 there were no fewer than 182,917 local leaders acting as demonstrators or serving as chairmen or members of extension committees in their respective communities or in similar ways. The report states that " it is the belief of many extension workers that the development of this rural leadership from among the farming people themselves has been one of the most helpful and important results of the whole 10 years of cooperative extension work, for the reason that when a local leader is developed permanency of effort in that community has been provided for and the work can be expected to go on without serious interruption even if the county extension agent temporarily drops out."

The improvement of extension methods has been one of the large matters to receive attention during the decade. The success of these methods is attributed to two fundamental considerations, a full recognition of local people, conditions, and practices and the enlisting of the active participation of the individual farmer and his family both in the planning and in the carrying out of local exten-

sion programs. There has been a steady evolution from the early attempts to depend upon Government owned and operated demonstration farms, through a period of farmer owned and operated demonstration plats or other demonstration units under Government plans and directions, to the present system of farmer owned and operated demonstration units following plans developed by farmers and agents of the Government counseling and working together.

At the end of the 10-year period, it is stated, the methods of approach were being thought of by extension workers quite as much as the type of subject matter to be transmitted. "This thought has given increased recognition to the psychological presentation of subject matter in place of logical presentation from the subject-matter standpoint. There has come to be a general recognition of the need for a great variety of agencies to be used in presenting an idea in a variety of ways. To that end have come exhibits to reinforce a single idea; tours to see some definite thing; posters with one thought; slogans and couplets whose jingle, either from alliteration, meter, or rhyme make a certain thought stick; movies that give action to the central thought presented; slides that pick out high points of interest; mock trials and debates, clothing the serious thought in a spirit of mirth and fun; and the radio, that mystifies. These and other agencies are used to bombard the mind until thought is translated into an approved action."

To the motion picture and the radio special credit is given for successful contacts with many additional farm homes. During 1924 requests from extension workers for 2,324 educational films were filled by the department's Office of Motion Pictures, which now has available 1,862 reels of film on 213 subjects, and exhibits of motion pictures were reported by county agents as having been given at 28,856 meetings. Similarly, despite the relative newness of radio in 1924, broadcasting stations were being maintained by 26 State colleges of agriculture, and a questionnaire indicated that about 370,000 farm families were using receiving sets at that time.

Since the first object of extension work is to bring about the adoption of an improved farm practice, a measure of its success is the extent to which better methods have been undertaken as a result of the extension activities. Manifestly, many of the contacts are too intangible to admit of accurate determination, but the data obtained by extension workers along this line are none the less of considerable interest. According to the statistics which have been collected, the average number of improved practices reported to have been adopted during the 5-year period 1920–1924 is slightly in excess of 4,000,000 per year. In many cases, of course, several practices were introduced into the same group, but it is estimated that nearly 3,000,000 different

farms and homes have been effectively reached each year by extension.

Broadly speaking, the improved practices have covered nearly every phase of farm life and every branch of subject matter, though the emphasis in the various communities has naturally differed quite materially. As an example, very definite progress for the decade is reported in the improvement of soil fertility as evidenced by the wide use of lime, cover crops, green manures, and high-anaylsis fertilizers. During 1924 extension work in soil fertility was reported by 1,903 extension agents, who conducted 38,589 result demonstrations and influenced 262,351 different farmers to put into practice one or more of the improved practices taught. A total of 167,886 farmers followed the advice of the agents in the use of commercial fertilizers, 34,638 farmers applied lime or limestone for the first time, 49,845 additional farmers conserved farm manures, and 25,455 farmers began the plowing under of cover or other green-manure crops to increase soil fertility.

The soil campaigns have also been effectively supplemented by extension work in rural engineering along the lines of terracing, drainage, irrigation, and land clearing. As one result of this work, ravages of soil erosion have been materially diminished in the South, where large numbers of well-constructed terraces have superseded the washed and gullied fields of a few years ago.

In field crops extension workers have emphasized particularly the use of seed of improved and standardized varieties, the development of adequate sources of good seed, the organization of seed-improvement associations composed of and operated primarily by the farmers themselves, and the value of smut control of cereals. They have also taken an active part in the general improvement of the fruit industry through pruning and spraying demonstrations, the renovation of old and neglected orchards, the improvement of orchard tillage and cover crops, orchard fertilization, spray-schedule service, the formation of spray rings, the selection of varieties adapted to the various regions, and the establishment of central grading and packing houses. In livestock improvement they have supplemented other agencies in disease control, have stimulated the development of dairying, especially in the Southern and Western States, and have fostered the improvement of herds and flocks. In poultry work alone nearly 1,000,000 farmers have been reported as changing their practices during the decade, owing to demonstration work in poultry culling, eradication of diseases, proper and economical feeding, egg grading, and poultry dressing and marketing.

Within recent years much time and effort have been given to economic problems. Such activities have included, in general, the giving of information on methods of organizing commodity market-

ing and purchasing associations and explaining the conditions necessary to their success and the demonstrating of better business principles of farming, including the value of the farm record as a means of determining factors limiting success. The extension agent has also given consideration to the most advantageous methods of disposing of the farmer's products and of purchasing his supplies. His efforts along this line have been confined to counseling with the farmers on the type of cooperative organization to form, the contract most suited to the needs of such an organization, the laws governing its operation, and the grading and packing of products. It is of interest to note that during the past 5 years the amount of time required of extension agents on marketing organization problems has been gradually decreasing, partly because these associations are now so well established that they no longer need much of the assistance formerly rendered.

The decade has brought much aid to the farmer's wife and children. Home demonstration work, beginning in 1910 with 4 county workers, reached its peak under the war stimulation with 1,715 home demonstration agents. With the discontinuance of emergency funds, the postwar ebb was to 699 workers in 1921, since which time there has been a steady rise to 930 counties in 1924. In scope the work has covered practically every phase of farm home activitiy and interest. In 1924, it is estimated that in food preparation alone there were 59,915 demonstrations with adults and 50,446 with boys and girls, that general improvement in meal preparation was brought about in 50,636 homes, and that 11,934 homes began budgeting the family food supply. Similar reports were obtained as to food preservation, clothing extension, home management, and house furnishing, and home health and sanitation.

The boys' and girls' club work, from the first a characteristic and appealing activity, met with large expansion during the war period when a maximum of over 1,000 county club agents were employed. Under the stress of economic readjustments in a large number of States, many separate agents for this purpose were later dispensed with and responsibility for organization of young people given the county agricultural and home demonstration agents. Considerable shrinking in membership resulted, but it is estimated that for the entire decade more than 5,000,000 boys and girls were enrolled. In 1924 an increase over 1923 is reported from 459,074 to 510,355 members, of whom 283,283 completed projects undertaken. It is pointed out, however, that not more than 1 in 22 of those eligible for enrollment are at present identified with the work and that large opportunity remains for increased service.

Another phase of the work for which specific data are available is that of negro extension. This activity had been built up practically

within the 10-year period to a point at its close where nearly 300 negro agents were employed and the year's attendance at meetings exceeded 1,000,000 people. Many concrete accomplishments are recorded, and it is stated that "when it is remembered that negro extension work has been established in a period of transition, turmoil, and readjustment, the significance is all the more remarkable. It is a fine tribute to the good work of the negro agents that, when the period of retrenchment came soon after the great war, their force and their appropriations were the only ones which were not reduced."

As the outstanding achievements of the decade the following summary is given:

"Cooperative extension work has vitalized the State colleges of agriculture and the United States Department of Agriculture as agencies of practical helpfulness for a large majority of the farming people of the country.

"Cooperative extension work has improved materially the farm and farm-home practice of the whole country. It has brought about the establishment of more profitable systems of growing and marketing farm products in many large agricultural areas.

"Cooperative extension work has been responsible for a rapid and general development of rural organizations. It is fast establishing the habit of group thought and action in country neighborhoods.

"Cooperative extension work has established the self-conducted demonstration by the pupil as the method of teaching most applicable to the mass of people. The demonstration, likewise, has proved to be the most convincing basis for printed, oral, or pictured appeal to those who can not witness or take part in the demonstration itself.

"Cooperative extension work has brought about among country people, both young and old, a pride in farm life and in extension association and achievement that is materially aiding in rural improvement and progress. The finding of capable, unassuming men and women on the farms and encouraging them to become leaders of movements and of men and women in their communities, counties, and States has been a distinctive extension accomplishment to this end."

Answering the question of the significance of cooperative extension in American life, the report points out that "in a period when the physical, mental, and social horizon of the farmer and his family has expanded beyond all previous experience and when, on account of the World War, his standard of living was suddenly inflated and then, as suddenly, left without economic foundation, cooperative extension work came into country life as a steadying yet progressive influence. It aided the individual farmer in adjusting himself to the practical requirements of the economic situation and stabilized agri-

culture, still recognized as the foundation of national business activity and prosperity. It stimulated and made possible constructive group thought and action in the country neighborhood. It widened the horizon of the farmer beyond his plow and cattle and his immediate community to the county, the State, the Nation, and the countries of the world, giving him outlook, vision, pride in occupation, and ability to contribute intelligently and materially to solving the problems of the day."

On the basis of the experience of the past 10 years, the future trend of influence of the work is thought to lie in five main directions. These are enumerated as follows: Increasing group thought and action as a habit in country neighborhood life; encouraging conscious effort on the part of country people to retain and capitalize the best features and attractions of country life and to work out for themselves the soundest way in which to make available to their young people and to themselves the best in education, recreation, and social life which the country and town afford; expanding boys' and girls' club work and developing supplementary agencies that will make the practical influence of extension association, teaching, and training as available as public-school education to all country boys and girls; furthering opportunities for the economic and social development of the farm woman that will place her on a more equitable footing with the modern, wage-earning woman of the city in standards of living and in opportunities for community activity and personal improvement; stimulating ambition for a more satisfying home and neighborhood life on the part of the farmer and his family based on healthful and sensible tastes and ideals and on a community of thought, appreciation, and action.

The relations of the experiment stations to the extension work are not discussed in the report, although they constitute a phase of considerable importance, as well as of one of direct interest to many readers of the *Record*. It may be recalled that at the time of the passage of the Smith-Lever Act there was some apprehension lest the rapid expansion of the extension work with its great popularity and close contacts with the people would tend to produce a feeling of sufficiency and to weaken the support for the stations. On this point the view was expressed in these columns in 1914 that "instead, this act gives more definite purpose and force to their work, and emphasizes its necessity in the development of agricultural practice. It is rooted in their activities and will be sustained by them. Without them it would soon suffer the fate of the old-style farmers' institutes. The new work will make enlarged demands upon the stations and bring them closer to the people. While it may at times overshadow them somewhat in the popular mind, it will add a vast army of workers to their clientele, who will realize their ultimate de-

pendence on experimentation and research, and who will be in closer touch with the people than any similar body of men and women yet organized. They will therefore be in the best position to popularize and advocate the work of the experiment stations."

The experience of the decade has substantially fulfilled the above prophecy. For a time interest in the new enterprise tended to obscure the work of the stations and to increase the difficulties with which they were confronted. Very soon, however, there came a realization of the limitations in existing agricultural knowledge and the material suited for extension teaching. As was predicted by Dr. A. C. True in his presidential address before the Association of American Agricultural Colleges and Experiment Stations in 1914, "the more the extension workers, and to a considerable extent the agricultural people with whom they work, come to realize that our present knowledge will only go a little way toward solving the multitudinous problems of agriculture, the more widespread and insistent will be the demand for more numerous and thorough investigation of these problems." This feeling was reflected in the active support given by extension workers to the stations in the movement for increased Federal support which ultimately crystallized into the passage of the Purnell Act of 1925.

This outcome has been fortunate indeed, for experience has abundantly demonstrated the interdependence of the stations and the extension work. The extension enterprise has provided a greatly enlarged market for the output of the stations, a matter as vital to these public-service institutions as the development of adequate markets for the farmers whom they serve. On the other hand, the extension services are in the long run as dependent upon research for their supplies of information as are marketing agencies upon the farms for their products.

All this is not merely a matter of theorizing, for in practice it has been found that in those States where contacts between these two groups are closest, where there is a full recognition of mutual dependence, and where this recognition takes the form of affirmative action on both sides to maintain helpful relations, the greatest and most permanent success has been attained. Their development of even more effective cooperation may solve many of the problems still confronting the cause of American agriculture which these two agencies serve in common.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

An introduction to the physics and chemistry of colloids, E. HATSCHEK (*London: J. & A. Churchill, 1925, 5. ed.,* [*rev.*], *pp. XIII+183, figs. 22*).—The text of this edition is substantially that of the fourth edition (E. S. R., 48, p. 801), with a few additions such as brief reports on recent investigations on nonaqueous systems, the correct interpretation of absorption experiments, the origin of the electric charge on colloid particles, and the vertical distribution of particles in suspension.

Specific gravity of concentration solutions of orthophosphoric acid, W. H. ROSS and R. M. JONES (*Indus. and Engin. Chem., 17 (1925), No. 11, pp. 1170, 1171, fig 1*).—For use in the method of preparing phosphoric acid by smelting phosphate rock in an electric furnace and recovering the volatilized product in a Cottrell precipitator (E. S. R., 54, p. 201), careful specific gravity measurements were made of solutions of orthophosphoric acid in concentrations varying by 1 per cent from 90 to 100 per cent and temperatures varying by 5° from 20 to 60° C. The data are presented in graphic and tabular form.

Preparation of an ash-free wood charcoal, L. H. REYERSON (*Indus. and Engin. Chem., 17 (1925), No. 11, p. 1114*).—By subjecting coconut shells to successive extraction for 96 hours with ether, 95 per cent alcohol, and distilled water, followed by drying and coking in the usual manner, a charcoal can be prepared which is said to have an average ash content of 0.4 per cent as compared with 2.35 per cent for samples of an activated Dorsite. The water extract of the charcoal thus prepared is neutral and its ash is almost entirely silica.

Preparation of *l*-arabinose from mesquite gum, E. ANDERSON and L. SANDS (*Indus. and Engin. Chem., 17 (1925), No. 12, pp. 1257, 1258*).—The method described consists in the hydrolysis of mesquite gum for 3 hours at 80° C. in six times its weight of 4 per cent sulfuric acid, removing the excess acid with barium hydroxide, concentrating the neutral solution, precipitating the salts with alcohol, and concentrating the alcohol solution until crystallization takes place. The product can be purified by recrystallization from water, mixtures of water and alcohol, and glacial acetic acid.

Characteristics of fish and allied oils, A. R. LANGE (*Indus. and Engin. Chem., 18 (1926), No. 1, p. 9*).—The physical and chemical characteristics of various fish oils, representing the average of a season's production, are given in tabular form.

Influence of tryptophan and other amino acids upon the stability and enzymic activity of pancreatic amylase, H. C. SHERMAN, M. L. CALDWELL, and N. M. NAYLOR (*Jour. Amer. Chem. Soc., 47 (1925), No. 6, pp. 1702–1709*).—In this continuation of the enzyme studies previously noted (E. S. R., 53, p. 106), evidence is presented along three lines in proof of the theory that the failure of certain amino acids such as lysine and tryptophane to exert a favorable effect upon the amyloclastic activity of pancreatic amylase (E. S. R., 48,

p. 608) is due to the fact that these amino acids are so bound in the enzyme molecule as not to be liberated by hydrolysis until the enzyme has practically completed the amyloclastic but not the saccharogenic stage of its action. The three series of experiments consisted (1) in determining the rate of inactivation of pancreatic amylase upon standing for several different time levels at temperatures of 10, 25, and 40° C. in the absence of substrate, with or without the addition of sodium chloride and disodium phosphate in the concentrations regularly used in determinations of pancreatic amylase activity, (2) in determining quantitatively the activities of the enzyme after standing for different lengths of time at 40 and 50° C., in the absence of substrate in aqueous solutions of pH 6.9 containing the above salts, with and without the addition of the typical amino acids glycine and tryptophane, respectively, and (3) in determining quantitatively the activities of the enzyme in the hydrolysis of starch at 40 and 50° in the presence of optimum concentrations of chloride, phosphate, and hydrogen ions, with or without the addition of glycine or tryptophane.

In the first series of experiments, the rate of loss of both the amyloclastic and saccharogenic activities of the enzyme was found to increase with the temperature and to be checked by the presence of sodium chloride and disodium phosphate and the adjustment of the H-ion concentration to values previously found to be optimum. In the second series glycine was found to exert a favorable action under all of the temperature conditions tested and tryptophane under conditions of time and temperature favoring more rapid hydrolysis. In the third tryptophane was found to exert a favorable effect upon the amyloclastic as well as saccharogenic action of amylase upon starch under the conditions found most favorable for action in the second series.

These results are considered to afford further evidence as to the protein nature of enzymes.

A chemical method for the standardization of ultra-violet light, J. E. Moss and A. W. Knapp (*Jour. Soc. Chem. Indus., 44 (1925), No. 37, pp. 453 T–456 T, figs. 2*).—The method described, which is called the uroxameter test, consists in the decomposition by ultra-violet light of an aqueous solution of oxalic acid in the presence of uranium acetate. The test solution is a mixture of 20 cc. of a 2 per cent aqueous solution of oxalic acid ($H_2C_2O_4.2H_2O$), 5 cc. of a 1 per cent aqueous solution of uranium acetate ($UO_2(C_2H_3O_2)_2.2H_2O$), and 20 cc. of distilled water. This is placed in a special apparatus consisting of a circular flat-bottom glass vessel 16 cm. in diameter and 8 cm. high, painted on the outside with one coat of red paint followed by three coats of white paint. The vessel fits in a metal support by means of which it can be tightly covered by a transparent lid of fused silica. During the determination the vessel is placed on a table which is mechanically rotated at from 5 to 6 revolutions per minute at a distance of 6½ in. below the geometrical center of the lamp being tested. The uroxameter value is the percentage of oxalic acid decomposed under these conditions in 30 minutes.

Data are given showing that this value is only slightly sensitive to variations in temperature, the amount of water present in the test solution, and the speed of rotation of the table, but is much more sensitive to variations in the area of the test solution exposed, the distance between the apparatus and the lamp, and the quantity of uranium acetate present, and to the presence of the silica plate and of a precipitate in the uranium acetate solution.

Official and tentative methods of analysis of the Association of Official Agricultural Chemists, compiled by R. E. Doolittle et al. (*Washington, D. C.: Assoc. Off. Agr. Chemists, 1925, 2. ed., rev., pp. XVI+535, figs. 25*).—In the revision of this volume (E. S. R., 44, p. 9), chapters on agricultural liming

materials and gelatin have been added, the chapter on water has been expanded to include brines and salts, the methods for sugar products formerly included in the chapters foods and feeding stuffs and saccharine products have been combined in a chapter entitled sugars and sugar products, and the methods for stock feeds have been rearranged in the chapter on feeding stuffs. The general plan of the first edition has been retained except that the cross references are to page and section instead of chapter and section.

A modified electrometric method for the determination of hydrogen ion concentration, S. GLASSTONE (*Analyst, 50 (1925), No. 592, pp. 327–330*).—The method described involves the use of a polarized platinum electrode, thus eliminating the apparatus necessary for the preparation and purification of hydrogen, as well as requiring less time to establish equilibrium. A trial of the method has shown it to be applicable in unbuffered solutions to those of pH less than 3 or more than 11 and to intervening solutions if well buffered. In alkaline solutions it is thought to be superior to the ordinary H-ion electrode method.

The determination of small amounts of iron by colorimetric methods, W. B. WALKER (*Analyst, 50 (1925), No. 591, pp. 279–283*).—Following the observation that the red color which ordinary nitric acid gives with thiocyanate and which interferes with the test for iron is due to nitrous rather than nitric acid, a modification of the usual thiocyanate method for determining iron was developed in which traces of nitrous acid in the nitric acid are removed by oxidation with hydrogen peroxide before the addition of the ammonium thiocyanate. With the modified method satisfactory results were obtained in the presence of acetic, tartaric, citric, arsenic, and boric acids and their salts and unsatisfactory in the presence of phosphoric, oxalic, and hydrofluoric acids and their salts. In the case of phosphoric acid, satisfactory results were obtained when not more than 0.05 gm. was present and unsatisfactory with larger amounts.

The presence of nitrous acid was also found to interfere with the ferrocyanide method by giving a yellowish green coloration. A suggested method for overcoming this is to remove the nitrous acid from the test solution and blank by boiling.

Data are given on the iron content of several materials by both methods. Although the results agree quite closely, the thiocyanate method is considered preferable where possible, as yielding the more accurate results.

Colloidal complications in the thiocyanate method of estimating soil acidity, F. O. ANDEREGG and R. P. LUTZ (*Indus. and Engin. Chem., 17 (1925), No. 11, pp. 1153, 1154, fig. 1*).—This is a discussion of the sources of error in the thiocyanate method of determining soil acidity, as described by Carr (E. S. R., 48, p. 812). One of these is the ease of hydrolysis of ferric thiocyanate and subsequent absorption of the ferric hydroxide by the collodial clay present in the soil which causes a shifting of the end point. The blue or green color developed in handling manganiferous soils is attributed to colloidal manganese dioxide, the color being due to the scattering of light from particles of special size rather than definite composition. The decolorization of the ferric thiocyanate occurring in soils high in manganese is thought to be produced by the mutual absorption of oppositely charged colloids.

Systematic detection of traces of aldehydes, E. C. CROCKER (*Indus. and Engin. Chem., 17 (1925), No. 11, pp. 1158, 1159*).—A scheme is given for the systematic examination of solutions of plant products for minute traces of aldehydes by selected color tests. Tables are included of the volume dilutions at which aliphatic and aromatic aldehydes are still detectable.

A new method for determining butter fat, G. Van B. Gilmour (*Analyst, 50 (1925), No. 591, pp. 272–279*).—The method described resembles the Kirschner method in that it gives a distillation number which is a measure of the butyric acid present in the fat, but is much simpler of execution. The success of the method is said to depend on the fact that when the volume of the solution from which the fatty acids are liberated is kept small the acids with the exception of butyric are thrown out of the solution. The technique is essentially as follows:

Five gm. of fat, 7.5 gm. of glycerin, and 2 cc. of a 1:1 solution of potassium hydroxide are heated in a small conical flask with constant shaking until the contents suddenly clear. After cooling somewhat, the soap is dissolved in about 20 cc. of distilled water and the solution and rinsings are transferred to a 50-cc. measuring flask, made up to the mark with distilled water, and transferred to a 175-cc. flask where the fatty acids are liberated by the addition of 15 cc. of a solution of sulfuric acid of such strength that 11 cc. just neutralizes 2 cc. of the potassium hydroxide solution. The flask is corked and shaken well for about a minute, after which its contents are filtered through a folded filter and 50 cc. of the filtrate transferred to a 350-cc. conical flask, diluted with 100 cc. of distilled water, and, after the addition of 0.1 gm. of powdered pumice, distilled at such a rate that 100 cc. of the distillate collects in 20 minutes. The distillate is finally titrated with N/10 sodium hydroxide, the number of centimeters required being the new distillation number.

Additional details are given for the application of the method to the determination of butterfat in margarine, together with data on the new number for mixtures of butterfat with other fats and oils.

The assay of cod-liver oil for vitamin "A," S. G. Willimott and F. Wokes (*Pharm. Jour. and Pharm. [London], 4. ser., 61 (1925), No. 3244, pp. 718–720*).—A critical discussion of the methods for the quantitative determination of fat-soluble vitamin in cod-liver oil introduced into the latest edition of the United States Pharmacopoeia.

Physical examination of sugar juices, K. R. Lindfors (*Indus. and Engin. Chem., 17 (1925), No. 11, pp. 1155, 1156, fig. 1*).—Methods are outlined for the determination of surface tension, viscosity Brix and viscosity purity, and visible and colloidal turbidity in cane sugar juices with suggestions for the practical application of these methods in sugar factory laboratories.

Requirements of pectin for the commercial jelly-maker, E. Jameson (*Indus. and Engin. Chem., 17 (1925), No. 12, pp. 1291, 1292*).—The qualities of an ideal commercial jelly are described, with the proportions of sugar, acid, and water necessary for such a product. In regard to the pectin, it is pointed out that at present different pectin preparations vary so widely that the proportions can not be stated in definite terms, but that a given preparation must be standardized carefully before being used in jelly making. The qualities of a satisfactory pectin are described briefly.

A qualitative test to show the absence of citrate or tartrate in mixtures, J. B. Peterson (*Indus. and Engin. Chem., 17 (1925), No. 11, p. 1146*).—The test is based upon the observation that citrates or tartrates even in extremely small amounts prevent the formation of the purple color in the reaction between ferric chloride and salicylates. In this test as usually conducted, amounts as small as 0.0002 gm. of citric acid, 0.0006 gm. of caffeine citrate, or 0.0003 gm. of potassium bitartrate are said to give an easily recognizable opalescence as compared with the control, while larger amounts discharge the color completely. The test is considered to be of the greatest value in confirming the absence of small amounts of citrates and tartrates in medicinal mixtures.

Manufacture of calcium citrate and citric acid from lime juice, F. H. S. Warneford and F. Hardy (*Indus. and Engin. Chem., 17 (1925), No. 12, pp. 1283–1286*).—Based upon the theory that the main cause of contamination of commercial calcium citrate by lime juice, phlobatannin, and phlobaphenes (E. S. R., 53, p. 717) is probably surface adsorption, a study was made of the relative influence of various factors on this adsorption. From the results of this study, three improved methods for preparing pale citric acid sirup and colorless citric acid crystals from lime and lemon juice are suggested.

In the first or simple liming process, the defecated juice is first treated at ordinary temperature with a thin lime cream containing sufficient alkali for exact neutralization of the total acids present. The temperature is then raised to the boiling point, and after a short time the calcium citrate is collected by sedimentation, centrifuging, or filtration and worked up in the usual way. In the second or simple intermediate Norit process, the defecated juice is partly hot-limed at pH 4, treated with Norit, and the liming completed. In the third or modified intermediate Norit process, defecated lime juice is neutralized with sodium carbonate at ordinary temperature to one-third of its total acid content, giving a reaction at this stage of about pH 3.8. It is then boiled with 1 per cent Norit for 15 minutes, cooled, and filtered. The filtrate is boiled with calcium chloride in excess of the amount equivalent to the sodium carbonate used and the neutralization completed with milk of lime, followed by a small excess of calcium carbonate. This process yields an almost colorless liquid and perfectly colorless crystals of citric acid, with the use of less lime and sulfuric acid than the usual commercial process but with additional cost factors in the soda ash and calcium chloride.

The quantitative determination of cotton, linen, and wood fibres in paper pulp, W. Dickson (*Analyst, 50 (1925), No. 592, pp. 317–323, pl. 1*).—The author's method of distinguishing between hemp and wood fibers in paper pulp by examination under polarized light (E. S. R., 50, p. 509) has been extended to include linen fiber.

On heating the pulp with a freshly prepared solution of ammoniacal sulfur nitrate and subsequently clearing with dilute nitric acid, cotton fibers were found not to retain the stain, while linen appeared practically black under the microscope. Viewed under polarized light, cotton fibers showed up brighter and linen were merged in the black background. In wood fibers most of the cells were comparatively little stained, although a few were difficult to distinguish from the linen except by differences in size.

Caroá fiber as a papermaking material, M. B. Shaw and R. R. Rumsey (*[Tech. Assoc. Pulp and Paper Indus.], Tech. Assoc. Papers, 8. ser., No. 1 (1925), pp. 107–109, figs. 4*).—Laboratory tests conducted on the fiber of the caroá plant (*Neoglaziovia variegata*), a native of Brazil, indicate that the fiber would be a very satisfactory paper-making material. The preliminary treatment of the plant affects considerably the characteristics of the paper which can be made from the fiber. The fiber from the untreated plant is difficult to bleach but makes a very strong paper. The material treated by being cut and beaten or fermented in water solution gives more pulp, which is easily bleached and produces a fairly strong paper. Treatment of the fiber with small amounts of caustic soda yields pulp the paper from which is suitable for bag or wrapping purposes and with larger amounts a pulp comparing favorably with rag stock. Microphotographs are given of caroá fiber alone and with rag and sulfite fibers. The caroá fiber is cylindrical, comparatively long, and of small diameter.

Bibliography of papermaking for 1924, C. J. West and A. Papineau-Couture (*[Tech. Assoc. Pulp and Paper Indus.], Tech. Assoc. Papers, 8. ser.,*

No. 1 (1925), pp. 110–144).—A classified bibliography of the 1924 literature on paper making indexed alphabetically by authors.

METEOROLOGY

The value of pyrheliometric readings alone for investigations on solar radiation and weather forecasting, C. F. Marvin (*Abs. in Bul. Amer. Met. Soc., 7 (1926), No. 2, pp. 21, 22*).—The author considers the pyrheliometer "the one basic and indispensable instrument in every solar constant determination." He holds that it gives constants "of a far more permanent character than are those of the bolograph," and that "the further study of solar constant values for evidence of real solar variability must await far more plentiful and more prompt publication of pyrheliometer observations alone and from as many high-class stations as possible."

International cooperation to maintain several entirely independent observations is urged.

The applications of meteorology to agriculture and travel [trans. title], G. Reboul (*Bul. Soc. Encour. Indus. Natl. [Paris], 124 (1925), No. 7, pp. 577–594, figs. 13*).—The value to the farmer and the tourist of weather forecasting and a knowledge of climatology is discussed, with specific reference to conditions in France and particularly to the climatic controls and centers of meteorological action operative there, such as the low-pressure center over Iceland and the high-pressure center over Siberia and eastern Europe, as well as sun-spot frequency.

The information which the meteorologist can now give the farmer regarding future weather (forecast) is considered to be of less value to him than that which is available regarding past weather (climatology). Examples of the relation of temperature to germination and growth of a number of crops are cited.

Report of weather observations, C. H. Steelman (*New Jersey Stas. Rpt. 1924, pp. 66–69*).—Tables show the mean monthly temperature as compared with the normal, the monthly maximum and minimum means of temperature, and the daily and monthly precipitation at the college farm at New Brunswick for the year ended June 30, 1924. The summer of 1923 was abnormally dry following a dry spring and "had a noticeable effect on all kinds of vegetation, including fruit." The following winter was mild, with little snow. The spring of 1924 was cold and wet. "The combination of rain and low temperature resulted in delaying fruit development to such an extent that, by June 1, it was at least 10 days or 2 weeks later than normal."

Weather and potatoes in Wyoming, G. W. Pitman (*Bul. Amer. Met. Soc., 7 (1926), No. 1, p. 14*).—In this abstract of a paper presented at the 1925 meeting of the American Meteorological Society at Kansas City, Mo., it is stated that the ideal climate for the potato "is one in which there is about 14 in. of rainfall and an average temperature of 64° for a period of 128 days, which includes dates of 2 weeks before planting until 2 weeks previous to digging. Artificial conditions of irrigated districts must approach the natural closely to produce the best results. The potato districts of Wyoming average 61.6°, with an average rainfall of 9.62 in. for a period of 138 days, but irrigation is practiced in several localities. . . .

"Temperature conditions for July and May appear to affect yields most. If July was warm the crop was good about 22 per cent of the time, but if cool and wet the crop was normal or greater about 99 per cent of the time; if cool and dry the probability was on a 50–50 basis; only two Julys of the 25-year period were both warm and wet, and the crops were less than normal in both

seasons. Temperatures for May appear to have an indirect influence through advancing or retarding the season, which in turn either places the focal date of the hot spells of summer, July 16, within the period of blooming of 'new potatoes,' or else delays this period of development until after the focal date, when it is generally cooler and more favorable; an advanced season is accompanied by good crops only 14 per cent of the time, while crops are normal or better 90 per cent of the time when the season is delayed. Therefore, the average date of planting, May 10, should be postponed until the closing days of May."

Observations of the German Phenological Service during the year 1922 [trans. title], E. Werth (*Mitt. Biol. Reichsanst. Land u. Forstw. No. 25 (1924), pp. 5–189, figs. 3*).—Observations by the German Phenological Service on the course of development and enemies and diseases of cultivated plants and on general phenological phenomena are recorded in detail. The regions of like dates of blooming of apples and of blooming and harvest of rye in 1922 as compared with the mean of many years are mapped.

SOILS—FERTILIZERS

The soil and the fertilizer.—I, The soil, C. Schreiber (*Le Sol et les Engrais.—I, Le Sol. Gembloux: Jules Duculot, 1924, vol. 1, pp. 171, figs. 10*).—The first part of this publication deals with the origin, composition, and general properties of soils and discusses their constituents. The second part deals with soil character, qualities, and defects, and with the fertilization and crop adaptation of prevailing soil types.

Percolation in colloidal soils, considered in relation to swelling and cohesiveness, F. Hardy (*Jour. Agr. Sci. [England], 15 (1925), No. 4, pp. 434–443*).—Studies conducted at the Imperial College of Tropical Agriculture, Trinidad, on the rate of horizontal flow and on the rate of gain in mass for both kerosene and water in fine and crumb fractions of three siliceous soils containing different amounts of calcium carbonate and in two lateritic soils, are reported. The methods of experimentation employed were those elaborated by Green and Ampt (E. S. R., 25, p. 620), whose equations were found, however, not to fit the values obtained.

The siliceous soils possessed relatively high swelling coefficients, and their component particles when wetted were found to cohere to a greater or lesser extent, depending on the lime content. These properties appeared to account for the relatively low rates of permeability to water in these soils. Lateritic soils, on the other hand, possessed low swelling coefficients and low cohesiveness, and water percolated through them relatively very rapidly.

The minimum soil moisture available to plant roots [trans. title], N. V. Lobanov (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 2 (1925), No. 4, pp. 243–256, figs. 6*).—Studies are reported which showed that when the soil moisture sinks below the so-called inactive supply it becomes entirely unavailable to plant roots. The inactive moisture supply is considered to be about equal to the maximum hygroscopicity of the soil, and is independent of the conditions of transpiration and absorbing surfaces.

The wilting coefficient for plants was found to depend upon the transpiration conditions and to vary from 1.5 to 3 times the maximum hygroscopicity of the soil. It did not vary widely for the different ordinary crops.

It is considered necessary in the physiological judgment of soil moisture to investigate the critical moisture values in all soil strata to which plant roots have access, since the inactive moisture, the wilting coefficient, and the maximum hygroscopicity of soils may vary widely. This is said to be especially

true of podsol soils. It is also concluded that for practical purposes the wilting coefficient may be taken as double the hygroscopicity.

Preliminary treatment of soils with ammonia for the Atterberg sedimentation analysis [trans. title], E. Blanck and F. Alten (*Jour. Landw., 73 (1925), No. 1, pp. 39–43*).—In a second contribution from the University of Göttingen on the subject (E. S. R., 54, p. 414), studies are reported which showed that preliminary treatment with 2.5 per cent ammonia solution of 15 soils typical of the humid sections of Germany did not tend to dissolve out certain of the mineral constituents. It seems probable that this tendency is limited largely to the arid sandy soils dealt with in the previous studies.

Soil survey of Washington and Ozaukee Counties, Wisconsin, W. J. Geib et al. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1921, pp. IV+1529–1574, pls. 4, figs. 2, map 1*).—This survey, made in cooperation with the Wisconsin Geological and Natural History Survey and the University of Wisconsin, deals with the soils of an area of 424,960 acres comprising two counties in southeastern Wisconsin. The drainage of the eastern part of the area is through the Milwaukee River into Lake Michigan. The extreme western part is drained chiefly to the west into the Rock River.

The soils of the region are of glacial, lacustrine, and alluvial origin. Including peat, 37 soil types of 15 series are mapped, of which Bellefontaine silt loam, Kewaunee silty clay loam, and peat cover 21.5, 10.7, and 10.3 per cent of the area, respectively.

Old glacial limestone soils of Ohio, G. W. Conrey (*Ohio Bimo. Bul., 11 (1926), No. 2, pp. 69–75, figs. 7*).—A brief survey of the physical properties of the old glacial limestone soils, which are confined to parts of 7 counties in the southwestern portion of Ohio is presented. This region presents great contrasts in topography, and the upland is a plain about 450 ft. above the Ohio River. On the broad divides level surfaces are presented which are very poorly drained.

Soils of Esthonia [trans. title], A. Nõmmik (*Veröffentl. Kab. Bodenk. u. Agr. Chem. Univ. Tartu (Dorpat) Eesti, No. 2 (1925), pp. 69, figs. 34*).—The results of a physical and chemical survey of the prevailing soil types of Esthonia are given.

Investigations on soil sterility (bodenverhagerung) [trans. title], E. Knickmann and M. Helbig (*Ztschr. Pflanzenernähr. u. Düngung, 5 (1925), No. 4, Wiss., pp. 209–248*).—Investigations on certain German soils which have become unproductive, apparently through the action of wind and sun, are reported.

These soils have a large humus content, especially in the upper stratum, and have a 50 per cent greater water capacity than normal soils. The mechanical analyses of surface and subsoils are similar, while in normal soils the finest particles predominate in the subsoil. The surface soils contain an excess of alkalies. The humus content of these soils was found to be less soluble in hydrochloric acid and more soluble in ammonia solution than that of normal soils, and contained less nitrogen.

All these soils showed an acid reaction, which was greatest in the humus stratum. Water deficiency caused the greatest differences in the acidity conditions, and is considered to be the main factor in the occurrence of sterility in these soils.

[Soil fertility studies at the Arkansas Station] (*Arkansas Sta. Bul. 203 (1926), pp. 3–6, fig 1*).—The results of studies of the availability of rock phosphate in acid soils are said to indicate, with few exceptions, the ability of crops to assimilate phosphorus added to such soils in this form. Corn showed a greater ability to utilize this material than the other crops. The use of

lime with rock phosphate on acid soils reduced the amount of phosphorus assimilated by the crops and the amount of phosphorus available to crops.

Data on the effects of cultivation are said to indicate clearly the importance and necessity of keeping down weeds. Cultivation has not materially increased nitrate accumulation.

Sodium nitrate and ammonium sulfate have produced approximately the same increases in crop yields, with cottonseed meal ranking next in order. Calcium cyanamide has shown the least results.

Under a 3-year rotation of corn, wheat, and clover no substantial increase in yield was had from any form of lime. Increases in yields were obtained only when fertilizing materials other than lime were added.

Data from a combination fertilizer and rotation experiment indicate the highest increases from wheat and oats, and that acid phosphate has given the largest returns. Sodium nitrate produced some profitable increases, but potassium chloride showed little effect.

[Soil fertility experiments at the Indiana Station] (*Indiana Sta. Rpt. 1925, pp. 39–42, figs. 2*).—A comparison of various American potash fertilizers with standard imported potash indicated that the German and domestic potashes gave approximately equal results. There was very little difference in the results from sulfates, chlorides, and carbonates of potash. In borax tests injury was caused where the borax was applied in the row. Where borax was used broadcast slightly increased yields of corn were obtained. It is stated that so far as is known the potashes now on the market do not contain injurious amounts of borax.

Experiments on the relative value of different liming materials showed that 10-mesh ground limestone was fully as effective as hydrated lime, both in the first year and subsequently. There was no advantage in grinding limestone any finer than 10-mesh. Marl gave results fully equal to both lime and ground limestone when applied in amounts of equal lime content.

Pasture improvement (*Connecticut Storrs Sta. Bul. 136 (1925), pp. 432, 433*).—The second year of this experiment is briefly reported, indicating that lime and acid phosphate treatments show an increase as measured in pounds of beef produced.

Soil tillage as a factor of nitrate accumulation [trans. title], A. Kudríavtseva (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 2 (1925), No. 4, pp. 261–302, figs. 13*).—Studies are reported which indicated the importance of tillage in the biological processes of soil, with special reference to the mobilization of nutrient materials.

Nitrification reached a maximum in steadily fallowed soils at the time of planting and then decreased. It was governed largely by the development of the crop in intermittently fallowed soils, decreasing during crop development and increasing after the harvest. Soils under crops ordinarily contained only traces of nitrate. This was attributed partly to assimilation by plant roots and partly to loss by leaching.

Fertilization of fallow soils with stable manure or mineral fertilizers had no essential influence on nitrification. It was found further that high temperatures favored nitrification, while excessive moisture retarded it.

The continuous growing of wheat and rye with and without a legume green-manure crop—season 1923, J. G. Lipman and A. W. Blair (*New Jersey Stas. Rpt. 1924, pp. 247–250*).—The progress results of this work (E. S. R., 52, p. 721) indicate that, in striking contrast with the results for previous years, the yields of wheat and rye on plats without soy beans were larger in each case than those on plats treated with soy beans. This change is considered to be due to the growth of volunteer clover. The percentage of nitrogen

in the rye grain was somewhat less for the soy-bean plat than for the plat without soy beans. The reverse was true for wheat. The total nitrogen in each instance was lowest on the soy bean treated plats. Data on the percentage of nitrogen in the grain and straw over the 14-year period ending with the 1922 crop are also briefly presented.

The continuous growing of corn with a legume and non-legume green-manure crop—season 1923, J. G. LIPMAN and A. W. BLAIR (*New Jersey Stas. Rpt. 1924, pp. 250–252*).—The progress results of these experiments (E. S. R., 52, p. 721) indicate a difference in total nitrogen in favor of the legume section. The yield of stalks was practically the same on the two sections. The yield of grain on the legume section exceeded the yield on plats receiving manure at the rates of 0.5 and 1 ton per acre, and was almost as large as the yield on the plat receiving 2 tons of manure per acre.

Time to apply nitrogenous fertilizers [trans. title], W. SCHNEIDEWIND (*Ztschr. Pflanzenernähr. u. Düngung, 3 (1924), No. 3, Wirtschaft.-Prakt., pp. 98–110*).—The results of a number of experiments on various soil types with different grain and root crops are reported.

These showed that the fall application of nitrogenous fertilizers such as ammonium salts and lime nitrogen gave better results than spring applications for winter grains such as rye and wheat on deep heavy soils. Such fertilizers apparently suffered little loss during the winter through leaching, and were more quickly available to crops in the spring.

Sodium nitrate, on the other hand, suffered heavy leaching losses when applied in the fall and gave better results on grain crops when applied as a top-dressing in the spring. On permeable sand soils even the organic nitrogenous fertilizers suffered nitrogen losses through winter leaching when applied in the fall. Better results were obtained on such soils by applying the inorganic nitrogenous fertilizers as top-dressings in the spring and the more slowly available organic fertilizers in small amounts in the fall. Similar results were obtained with spring and summer grain crops and with root crops. It was found that late top-dressings should be avoided with all crops, especially with lime nitrogen.

Phosphoric acid requirements of German arable soils [trans. title], O. LEMMERMANN and H. WIESSMANN (*Ztschr. Pflanzenernähr. u. Düngung, 3 (1924), No. 7, Wirtschaft.-Prakt., pp. 273–282*).—Data from experiments on the fertilizing action of acid phosphate and Thomas meal on grain, hay, and root crops in typical agricultural soils of Germany are summarized. These indicate that out of a total of 64 experiments only 15 showed a marked action of phosphoric acid fertilization, 4 showed a weak action, 9 a doubtful action, and 36 no action.

Neubauer's method for determining the phosphoric acid and potash requirements of soil [trans. title], H. EGNÉR (*Meddel. Centralanst. Försöksv. Jordbruksomrädet [Sweden], 286 (1925), pp. 16*).—Tests of the Neubauer method for determining the amount of available nutrient materials in soils are briefly reported. This method consists in the analysis for phosphoric acid and potash of rye seedlings after 18 days' growth in the soil to be tested under constant and easily reproducible conditions. The amounts of these nutrients removed from the soil by the seedlings under these conditions are taken as a measure of the nutrient content, and consequently as an indication of the fertilizer requirement.

A satisfactory correspondence was obtained between the method and the results of field experiments.

The available phosphate in soils, E. VANSTONE (*Jour. Agr. Sci. [England], 15 (1925), No. 4, pp. 460–465, figs. 2*).—Studies conducted at the Seale-Hayne

Agricultural College, Newton Abbot, are reported. The citrate soluble phosphate in each soil studied was determined by shaking separately 20, 40, 60, and 80 gm. of soil, which had passed a 1-mm. sieve, for half an hour with 500 cc. of a 1 per cent solution of citric acid. Similar determinations were also made with 2 per cent acid.

The curves indicating the amounts of phosphoric acid dissolved in a definite time for the acid soils were found to lie nearest the axis of ordinates, i. e., these soils contain the least soluble phosphate. As the percentage of calcium carbonate increased, the phosphate was more easily attacked by the acid, and the curves receded from the vertical axis. It is considered evident that the amount of phosphate dissolved depends on the total amount present. The ratio of soluble to total phosphate diminished rapidly as the amount of phosphate present increased.

The results are taken to indicate that the soluble phosphate in soils can be compared on the basis of equal amounts of total phosphate present. It is not possible, however, with the information so far obtained, to say definitely whether or not a soil will respond to phosphatic manuring. The data indicate further that for soils treated with 2 per cent citric acid a vertical line drawn through the 0.01 gm. soluble phosphoric acid point on the curve divides acid soils from limed soils.

Influence of neutral salts on the decomposition of phosphorite by peat and soil [trans. title], D. N. Prianishnikov (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 2 (1925), No. 4, pp. 235–242*).—Studies are reported which showed that the hydrogen of the insoluble carboxyl compounds can be displaced by the cations of neutral salts in cases in which insoluble salts are formed. Such an exchange reaction was observed between a solution of barium chloride and stearic acid. This is taken to indicate that the hydrogen of the carboxyl group in so-called humic acid in soils will react similarly with neutral salts.

The introduction of calcium salts did not decrease the solution of raw phosphates by humic acids in all cases as has been hitherto assumed. In fact a more marked solubility of raw phosphate was observed in peat in the presence of calcium sulfate than in the presence of potassium chloride, especially when a wide ratio of phosphorite to peat, such as 1 to 30, was used and the quantity of admixed cations did not exceed the saturation capacity of the peat.

In contrast to peat, when neutral salts other than lime salts were added to soil containing raw phosphate there was a marked increase in the amount of calcium salts in the soil solution which is associated with the solution of the phosphoric acid of the raw phosphate.

It is deemed desirable, in investigations of the decomposition of raw phosphates in peat, to consider not only the water soluble but also the partially soluble phosphoric acid in order to indicate more accurately the total amount of phosphoric acid available to crops in mixtures of peat and raw phosphates.

A new method of evaluating basic slags and mineral phosphates, E. Vanstone (*Jour. Agr. Sci. [England], 15 (1925), No. 4, pp. 491–496, figs. 2*).—Studies conducted at the Seale-Hayne Agricultural College are reported.

These studies showed that for each basic slag, superphosphate, and steamed bone flour tested the solubility in oxalic acid is proportional to the total phosphate present, and that a definite constant can be given for each which indicates its rate of solution in weak dilute acid. A comparison of these constants with the weights of phosphoric acid taken up by beans in pot experiments showed that the rate of solution in oxalic acid indicates the rate at which phosphoric acid is taken up by the plant.

It was found that the mineral phosphates Gafsa and Buccaneer were more soluble in 2 per cent oxalic acid than were the basic slags, which were very soluble in citric acid. The results are taken to indicate that there must be a great difference in the nature of the phosphates present in basic slags and of those in mineral phosphates.

It is concluded that if the solvent in soil is assumed to be carbonic acid the use of oxalic acid is to be preferred in testing the solubility both of phosphatic fertilizers and of soil phosphates, since oxalic acid resembles carbonic acid more closely in chemical constitution and properties than does citric acid.

Influence of sulfur alone and in combination with rock phosphate on plant growth, J. G. Lipman and H. C. McLean (*New Jersey Stas. Rpt. 1924, pp. 263–274*).—Greenhouse experiments with different soils and crops are reported which showed that on Sassafras loam soil acid phosphate increased the yield of barley, but that phosphate rock alone or in combination with sulfur did not affect the yield. The addition of sulfur along with rock phosphate in Elsinboro fine sand appeared to increase the percentage of phosphorus in the plants more than did rock phosphate alone. Further experiments with Sassafras soil showed a consistent increase in crop yield with acid phosphate, but none with rock phosphate alone or when mixed with sulfur.

Greenhouse experiments on the action of sulfur on crops in Sassafras and Penn loam soils showed that the growth of barley, buckwheat, and mustard is materially reduced by the application of sulfur, while soy beans are apparently not affected. On the other hand, in the same soils taken from different localities sulfur has been found to increase the yield of certain crops.

Greenhouse experiments with Sassafras soil to determine the influence of sulfur when used in combination with manure showed that a crop of radishes was greatly increased by this treatment.

Lime carriers containing magnesium, M. M. McCool and G. M. Grantham (*Michigan Sta. Quart. Bul., 8 (1926), No. 3, pp. 124–126*).—The results of field experiments with different lime carriers on Fox sandy loam soils are briefly presented which indicate the advantages of those materials containing appreciable amounts of magnesium.

Alkali investigations in the Sudan, A. F. Joseph (*Jour. Agr. Sci. [England], 15 (1925), No. 4, pp. 407–419, fig. 1*).—Studies conducted at the Wellcome Tropical Research Laboratories, Khartum, of the alkali conditions of soils in the Gezira area are reported.

The results showed that the cotton-growing area consists of a heavy clay soil, the proportion of clay being from 50 to 60 per cent in the upper layers, with a maximum at about the fourth foot. The water-soluble salts amount to about 0.2 per cent, and the proportion is highest at about from the third to the fifth foot. The alkalinity is highest at the second foot. The salts in the first 2 ft. consist mainly of sodium carbonate and in the third and fourth feet of sodium sulfate.

The irrigation water from the Blue Nile contains a very high proportion of alkali salts. These it is estimated would cause an increase of 0.01 per cent in the alkali content of the first 4 ft. of soil in a season of normal irrigation.

It was found that the sodium salts can readily act on the clay and that the sodium clay so formed hydrolyzes with the formation of sodium carbonate. Samples taken at the same time from good and bad plats in the same area showed a strong correlation between the salt content and crop-yielding power, and between pH and fertility. In the same season and in the same area un-

irrigated plats gave a higher yield than those which had been previously under the same system of cultivation.

Inspection of fertilizers, J. B. Smith and W. L. Adams (*Rhode Island Sta. Ann. Fert. Circ., 1925, pp. 12*).—Guaranties and actual analyses of 103 samples of fertilizers and fertilizer materials collected for inspection in Rhode Island during 1925 are presented.

AGRICULTURAL BOTANY

Report of the department of plant physiology, J. W. Shive (*New Jersey Stas. Rpt. 1924, pp. 275–277*).—In continuation of investigations on sources and availability of iron for plants (E. S. R., 52, p. 725), the author found that concentrations of iron slightly in excess of that required for normal growth may result in iron toxicity and in a chlorotic condition usually characteristic of a lack of iron in plants. Analysis of such plant tissues showed a relatively high iron content. However, the iron was precipitated in the roots and stems and did not enter the leaves.

Continuing work of the station on the effect of seed weight on the rate of plant growth (E. S. R., 51, p. 627), it was found that plants grown from small seeds have higher efficiency indices (as calculated according to Blackman's compound interest law) than those grown from heavy seeds, but the difference is not sufficiently higher to overcome the initial disadvantage of small seeds in short life cycle annual plants. With biennial and perennial plants equivalent crops may be expected from large and small seeds of a given species when grown under similar conditions.

Studies on the absorption of nitrogen from the ammonium ion and the nitrate ion have shown that cowpea seedlings in the early stages of growth absorb nitrogen more rapidly from ammonium solutions than from nitrate solutions, but in the later stages of growth the relation is reversed.

Additional data are given on the study of the salt requirements of plants (E. S. R., 52, p. 724). Analyses of alfalfa plants grown in nutrient solutions whose salt constituents were varied according to a definite plan showed that the nitrogen content varied in accordance with the relative proportions of the essential salt constituents. This fact and the results obtained with chlorine have led to a study of the effect of sodium chloride on the growth of alfalfa in solutions and in soil cultures.

The energy yield of chlorophyll photosynthesis [trans. title], R. Wurmser (*Ann. Physiol. et Physicochim. Biol., 1 (1925), No. 1, pp. 47–63, fig. 1*).—As alleged in statements previously noted (E. S. R., 46, p. 825; 53, p. 827), chlorophyll photosynthesis consists of a succession of coupled reactions rendered possible by the heterogeneity of the medium, the different reactions going on at different points.

The energy yield of photosynthesis may rise as high as 80 per cent, this high value signifying the coupling of reactions under conditions of reversibility.

Recent studies on the migration of inulin in grafted Helianthaceae [trans. title], L. Daniel (*Trav. Sci. Univ. Rennes, 17 (1924), pp. 21–83, figs. 14*).—Largely, this is a presentation or review of recent claims on relations between stock and scion in grafted plants.

Hydrogen-ion concentration gradient in plants, F. G. Gustafson (*Amer. Jour. Bot., 11 (1924), No. 1, pp. 1–6, figs. 3*).—Data submitted show an H-ion concentration gradient in corn, squash, pole bean, pumpkin, and sunflower plants. This gradient is not always in the same direction.

The effect of hydroxyl-ion concentration on the growth of walnut roots, H. S. Reed and A. R. C. Haas (*Amer. Jour. Bot., 11 (1924), No. 2, pp. 78–84,

figs. 6).—The purpose of this work was to determine whether the injurious effects observed in case of walnut roots are due to high concentration of the hydroxyl ions or to calcium starvation. The method used included that which has been described by Trelease and Livingston (E. S. R., 47, p. 127), as well as that of employing for each plant a good sized container (holding from 2 to 3 liters of the culture solution).

It is apparent that walnut seedlings may be successfully grown in water cultures, and that they are very sensitive to a lack of calcium in the solution. Seedlings may be grown for some time in a solution of a single calcium salt, but they perish quickly when calcium is lacking from an otherwise complete medium. Roots supplied alternately with a calcium hydrate solution and with a calcium-free solution, during 24-hour periods, show marked injury during the second exposure to the calcium-free solution. Walnut seedlings have been grown successfully for periods of at least a week in solutions of calcium hydrate (pH 9 or somewhat higher), which were renewed continuously during the entire period. It is concluded, therefore, that the injury to walnut roots from solutions of high pH values is to be ascribed principally to calcium starvation rather than to the effect of high concentration of hydroxyl ions upon the plant.

Some effects of certain calcium salts upon the growth and absorption of citrus seedlings, H. S. Reed and A. R. C. Haas (*Amer. Jour. Bot., 11 (1924), No. 1, pp. 15–18*).—Citrus seedlings grown in a calcium chloride solution absorbed more calcium cations than chloride anions. In the concentrations employed, root growth was influenced more by the amount of calcium in solution than by the character of the anion with which the calcium cation was combined.

A study of the factors concerned in the reddening of leaves of Diervilla lonicera, A. E. Keener (*Amer. Jour. Bot., 11 (1924), No. 2, pp. 61–77, pl. 1, figs. 3*).—Mature leaves of *D. lonicera* in the Douglas Lake region, in Michigan, redden in sunshine but remain or become green in shade or in sunlight reduced by as much as half. Transpiration is usually lowered, and stomata are closed in the reddened plants. Soil moistnre content was found to be lower in case of the reddened plants, though red leaves usually contained slightly more water than did green leaves. Red plants in sand, artificially well watered, tend to redden even in the shade. Red plants from poor soil remained red when transplanted to good soil, and green plants grown in rich soil remained green when transplanted to a more exposed location.

Apparently, the factors concerned in reddening include (vertical) sunlight, soil, water content, and amount of evaporation and transpiration.

The influence of meteorological factors on tree growth.—I, The influence on trunk circumference of a fir tree [trans. title], H. Nakashima (*Jour. Col. Agr., Hokkaido Imp. Univ., 12 (1924), No. 2, pp. 69–263, pls. 14, figs. 3*).—Studies on trunk circumference growth in *Abies mayriana* are described, with results in graphical form and tabular detail, as carried out and interpreted in terms of growth phases, increment, and proportion.

Studies of the biology of Brachysporium trifolii, L. Bonar (*Amer. Jour. Bot., 11 (1924), No. 3, pp. 123–158, pls. 2, figs. 2.*)—During the progress of studies previously noted (E. S. R., 46, p. 743), there appeared what seemed to be the beginning of perithecial bodies. This fact led to the present studies of the organism, *B. trifolii*, bearing upon its physiological reactions and its life history in culture and on its proper host.

The development of mycelium, conidia, or bodies is largely conditioned upon environment. The organism has a wider range as to conditions suitable for vegetative growth than for asexual reproduction. The conditions for asexual

reproduction are also more general than those for the production of the stalked bodies. These bodies appear to be immature perithecia, or else to be homologous therewith. A distinct albino mutation has been found once. Long culturing attenuates the virulence of the fungus. Different species of Trifolium show various degrees of susceptibility to attack by *B. trifolii* in the inoculation chamber.

A study of factors promoting pycnidium-formation in some Sphaeropsidales, L. H. Leonian (*Amer. Jour. Bot., 11 (1924), No. 1, pp. 19–50*).—Twenty organisms of the order Sphaeropsidales were cultured in an especially favorable medium, all readily producing pycnidia. A specially suitable method was devised and used.

Under light exclusion, 2 failed to develop pycnidia, 12 showed reduced reproduction, and 6 were unaffected. A temperature of 30° C. was generally favorable. A constant temperature of 8° inhibited pycnidium formation in darkness in 9 forms, but in none when light was supplied. Decrease of oxygen supply suppressed fruiting in 3 species, reduced it in 11, but produced no effect in 6. Adsorption affected neither growth nor reproduction in abundant moisture. When submerged 8 species fruited freely, 3 failed to mature the spores, and 9 failed to fruit beneath the surface. Solidity of substratum is, therefore, a factor, as support. Generally high food concentration favors pycnidia formation, which hyphal growth parallels through a wide range. Transference after growth in a rich to a dilute nutrient solution improves reproduction, as does also the change from growth in a dilute to a rich solution. Osmotic pressure is not a factor in growth and reproduction. No evidence of autointoxication was seen. Change of environmental factors develops certain other tendencies.

The influence of vitamins upon the development of yeasts and molds, W. Lepeschkin (*Amer. Jour. Bot., 11 (1924), No. 3, pp. 164–167, fig. 1*).—The author describes briefly experimentation credited to A. Votschal to test whether the vitamins found in yeast (*Saccharomyces cerevisiae* I) are necessary for the life and growth of the yeast itself. "The effect of the vitamin upon the growth of the yeast can, of course, be remarkable only in the case of an excess of food, and if the culture lasts for many days no difference is observed between the quantities of yeast in all solutions."

As to the effect of vitamin on molds, use was made of *Penicillium glaucum*, and the effect of the vitamin was similar to that on yeast. "Concerning the cause of the effect of the vitamin, it may probably be either catalytic or similar to the effect of the coenzyme in the fermentation process, for growth may probably also be a catalytic process."

Succession of fungi on culture media, M. T. Cook (*Amer. Jour. Bot., 11 (1924), No. 2, pp. 94–99, figs. 2*).—In studies undertaken to throw light on the factors influencing succession in the appearance of fungi on media, the author employed a succession of two or three fungi cultured on indicated media, and the results, as regards growth, are detailed.

Significance of the behavior of sensitive stigmas, II, F. C. Newcombe (*Amer. Jour. Bot., 11 (1924), No. 2, pp. 85–93*).—Extension of observation and experimentation, as previously carried out (E. S. R., 49, p. 220), to other species having sensitive stigmas has given the results recorded in the present paper.

The African tulip tree (*Spathodea campanulata*) furnishes evidence, supporting that of other plants, that the continued closure of the stigma lobes so as to include the pollen promotes, and in dry air conditions, pollen germination. The second closure of the stigmas appears to be related to the amount of moisture in the air. Besides *S. campanulata*, *Bignonia radicans*, and *Crescen-*

tia cujete showed sensitivity of the stigmas to pressure. A revised list is given of five families having members with stigmas sensitive to contact.

Precocious potato tuber formation [trans. title], S. J. WELLENSIEK (*Meded. Landbouwhoogesch.* [*Wageningen*], *27* (*1923*), *No. 3, pp. 24, pls. 4*).—Partial or total failure to come up, with very precocious tuber formation, occurred freely during 1915–1922 in the Netherlands, during 1921 in Germany, and at different times in England, France, and the Bermudas. Storage or keeping the tubers experimentally at from 9 to 13° C. (48.2 to 55.4° F.), produced this phenomenon, which occurred sparingly, if at all, at 1.5° and at 5°, though sprouts formed at these temperatures. Low water level in the fields during early growth and keeping the tubers at low temperature and in the light during storage are recommended.

A contribution to our knowledge of the flora of northern Saghalien, Y. KUDO (*Jour. Col. Agr., Hokkaido Imp. Univ., 12* (*1923*), *No. 1, pp. 68, pls. 12*).—This embodies, in English, systematically arranged with descriptions, the results of collection and study of 766 specimens in 402 species, comprised in 221 generic representatives of 67 families ranging from pteridophytes upward inclusive, as obtained apparently in 1921 and 1922 in northern Sakhalin. The vegetation is discussed according to character or location as Picea, broadleaf, and Larix forest; tundra, aquatic, river bank, and maritime vegetation; and grasslands.

GENETICS

A comparison of maize-breeding methods, G. N. COLLINS (*U. S. Dept. Agr. Bul. 1396* (*1926*), *pp. 22, figs. 7*).—The ear-to-row breeding method was compared at Sacaton, Ariz., with a method of close breeding in which inferior strains were eliminated through selfing and the surviving strains recombined. Starting in 1918 with two identical ear-to-row plantings from 20 ears of Sacaton June corn the crosses in the crossed experiment were made between the highest yielding rows and between the highest yielding plants regardless of row. In the selfed test plants in each row were selfed, and selections for the next season were made from the highest yielding rows and individual plants. After three years of selfing the selfed strains were crossed with the aim of reestablishing the vigor of the stock, undesirable lines having been eliminated.

Few of the numerous abnormalities observed appeared to be definitely associated with decreased yield, but in the selfed experiment a close negative correlation existed between yield of strain and number of abnormalities observed. Apparently eliminating the many minor abnormalities common in most corn varieties may increase the yield. The selection of selfed lines was effective in establishing high-yielding strains. In the selfed test selections from high-yielding progenies greatly out-yielded selections from individual high-yielding plants chosen without regard to progeny performance. In the crossed experiment the yields of selections from high-yielding progenies and individual high-yielding plants did not differ significantly.

In a comparison in 1923 alternate rows of a mixture of hand-pollinated seed from the crossed experiment out-yielded by about 25 per cent a mixture of F_2 progenies from crosses between selfed progenies. In a 1924 yield test involving continuously crossbred seed from the crossed experiment, crosses between selfed lines representing the F_1, F_2, and F_4 generations and the original variety, the highest yield was from the F_1 cross of selfed lines. The F_2 generation and the crossbred seed yielded about the same, both being undoubtedly superior to either the F_4 generation or the crib-selected seed. The crib-selected seed appeared to be significantly superior to the F_4 generation cross. The

coefficients of inbreeding showed that a narrow inbreeding was not incompatible with high yields. Seed stocks resulting from both methods were decidedly superior to the original variety. Breeding methods best calculated to eliminate deleterious variations in corn are discussed.

Studies of inheritance and evolution in Orthoptera.—V, The grouse locust, Apotettix eurycephalus Hancock, R. K. Nabours (*Kansas Sta. Tech. Bul. 17 (1925), pp. 3–231, pl. 1, figs. 4*).—This is a detailed report of the hereditary behavior of 11 factors found for determining color patterns in the grouse locust (*A. eurycephalus*) based on the records of nearly 500,000 individuals. Preliminary results of these experiments were noted (E. S. R., 42, p. 768).

From the study it appears that all of the 11 factors are located in 1 pair of chromosomes. One group of 3 factors is allelomorphic and located at one end of the chromosome, while two other groups of 3 and 4 each are located at a considerable distance from the first group with 1 gene located between. The distances between the loci are suggested, but final figures are reserved awaiting further data.

Further points brought out in this study have indicated that reproduction in the species is bisexual and parthenogenetic. Equal numbers of males and females are produced from fertilized eggs, but unfertilized eggs produce females almost entirely. Mated females were more than three times as prolific as when unmated. The color factors appeared to segregate and crossing-over was similar in females reproducing bisexually or parthenogenetically, but crossing-over in males was very rare.

[Inheritance in poultry at the Connecticut Storrs Station] (*Connecticut Storrs Sta. Bul. 136 (1925), pp. 435–439, fig. 1*).—The results of the following experiments are briefly reported.

Reduction of vigor through close inbreeding of White Leghorns.—The continuation of the inbreeding experiment has mainly confirmed the results previously noted (E. S. R., 49, p. 575). The most advanced family is in the fifth generation. The various families have been found to differ materially in egg size, egg shape, and bone size.

Crossing restores vigor.—Inbred females mated to their own brothers produced eggs of which 40 per cent hatched, but when the same females were mated the next year to males of other families, 80 per cent of the eggs hatched. The outbred chicks also grew more rapidly.

The causes of low hatchability.—A study of several thousand dead chick embryos has shown the presence of many abnormalities. In one type the bones are altered so that the head is short and the beak is curved, resembling what is designated as achondroplasia in man and other animals.

Incubating eggs in solutions.—In a study of the possible effects of incubating eggs in various chemicals on the production of abnormalities, several hundred eggs have been incubated in solutions of magnesium and lithium, with negative results as far as specific abnormalities are concerned. The eggs were either killed or continued to develop, depending on the strength of the solution.

Why is the rumpless chicken?—A more complete account of this investigation has been noted (E. S. R., 54, p. 526).

Biometrical measurements of laboratory animals.—I, Frog and mouse [trans. title], K. Saller (*Ztschr. Wiss. Biol., Abt. D, Arch. Entwickl. Mech. Organ., 105 (1925), No. 4, pp. 732–777, figs. 19*).—The measurements and relationships of the skeletal parts of the frog and mouse which may be of use for experimental purposes are pointed out, and formulas for the calculation of the usual biometrical constants are given.

Investigations of measurements and statistical variations of the crani of domestic dogs, a contribution to the question of evolution [trans. title],

R. GÖTZE and F. DORNHEIM (*Ztschr. Tierzüchtung u. Züchtungsbiol.*, 5 (1925), *No. 1, pp. 75–99, figs. 9*).—The relations between several cranial measurements of dogs are reported, which indicate that there are two distinct types.

Hereditary abnormalities of the viscera.—I, A morphological study with special reference to abnormalities of the kidneys in the descendants of X-rayed mice, H. J. BAGG (*Amer. Jour. Anat.*, 36 (1925), *No. 2, pp. 275–311, pls. 4, figs. 3*).—A more complete account of the investigation previously noted (E. S. R., 53, p. 833).

A note on the dimensional characters of the pollen grains of cotton with some reference to their inheritance, H. MARSLAND (*Empire Cotton Growing Rev.*, 2 (1925), *No. 4, pp. 348–352*).—Measurements made in 7 varieties and 3 hybrids showed that differences in pollen grain size are characteristic of different varieties of cotton. No correlation apparently existed between chromosome number and size of pollen grains. The F_1 hybrid had the pollen dimensions of the parent with large pollen. The variation in the size of pollen from different varieties was continuous, ranging from 108μ in Upland to 135μ in one type of Marie Galante. The pollen grain size of Triticum and of mutational forms of Oenothera are cited for comparison.

The relation of single color genes of rabbit races to the "dopa reaction" [trans. title], W. SCHULTZ (*Ztschr. Wiss. Biol., Abt. D, Arch. Entwickl. Mech. Organ.*, 105 (1925), *No. 4, pp. 677–710*).—Tests of the action of a product called dopa on the pigment cells of the skin of various races of rabbits have been conducted to throw light on the fundamental differences between the factors responsible for the colors. The results of the tests were mainly negative in that the dopa solution did not serve to differentiate colors which were similar in appearance but were genotypically different. The tests also added little to the study of the actual differences in the factors responsible, or in explaining the effect of cold in changing the color of certain types to black (E. S. R., 54, p. 428).

Chromosomal chimeras in the tomato, M. M. LESLEY (*Amer. Nat.*, 59 (1925), *No. 665, pp. 570–574, figs. 5*).—"In a study of cross sections of root tips from tomato plants grown from cuttings two plants were found in which certain roots were tetraploid either wholly or in part, while others were entirely diploid (24 chromosomes). . . . In the chimerical tomato plants studied the entire root or only a few epidermal cells may be tetraploid. No two roots are exactly alike. . . . It is evident that it is advisable that chromosome counts made from a few root tip cells in mitosis be checked by comparison with those of pollen mother cells at least in certain plants."

Off-type tubers, H. T. GÜSSOW (*Canada Expt. Farms, Div. Bot. Rpt. 1924, p. 29*).—Different off-type tubers from certified Green Mountain and Irish Cobbler potatoes were planted in soil conducive to the production of normal forms. At harvest it was observed that less than 1 per cent of the progeny from strawberry type, bull nose cylindrical, wasp waisted, or pointed at seed end resembled the parents in type. Round oblong (rose on end) showed 15 per cent round oblong with rose on the end and 6 per cent rose on the side, while round oblong (rose on side) showed 3.5 per cent round oblong with rose on the side and 10 per cent with rose on the end. Apparently these abnormal characters are not dominant and are probably produced by some factor other than heredity.

A new interpretation of the hereditary behavior of self-sterile plants, E. M. EAST and A. J. MANGELSDORF (*Natl. Acad. Sci. Proc.*, 11 (1925), *No. 2, pp. 166–171*).—Studies in Nicotiana at the Bussey Institution have shown that self-sterility is a Mendelian recessive in crosses between self-fertile and self-sterile species.

Self-sterility in such self-sterile species as *N. alata* and *N. forgetiana*, or their hybrids, is controlled by numerous inherited factors. Like combinations of these factors give like groups of individuals as far as their mutual compatibility is concerned. All members of a given self-sterility group are cross sterile with each other in reciprocal crosses, and all are cross fertile with members of every other group, with limitations shown in the data presented in this paper. These variations in compatibility apparently are based on hereditarily controlled reactions whereby some pollen tubes (compatible matings) show a rapidly accelerated rate of growth, while other pollen tubes (incompatible matings) show a slow and steady rate of growth which ordinarily precludes fertilization to occur within the life of the flower.

Conditions can be so controlled that the duration of the flower is prolonged, the rapidity of growth of the pollen tube is stimulated, and the opportunity for pollen-tube action is extended. By taking advantage of these various methods, selfed strains of self-sterile hybrids between *N. alata* and *N. forgetiana* were carried through 12 generations, with the idea that if the factors controlling the behavior of these self-sterile plants are distributed according to the regular Mendelian procedure, successive selfings should tend to eliminate heterozygotes. Furthermore, if compatibility between self-sterile plants is brought about by the existence of constitutional differences in certain factors, one ought to be able to produce near homozygous populations by selfing which would consist of very few intrasterile, interfertile classes. This expectation was realized.

[Natural hybridization in oats], C. Crépin (*Compt. Rend. Acad. Agr. France, 11 (1925), No. 36, pp. 974–978*).—Circumstances surrounding the appearance of natural oats hybrids observed by the author (E. S. R., 49, p. 529) and other investigators lead him to agree with Zade (E. S. R., 28, p. 337). It is concluded that the appearance in plats of "wild oats" resembling *Avena fatua* or *A. sterilis* is due to natural hybridization between one of these species and *A. sativa* and not to mutation.

Linkage of characters in plants [trans. title], O. Herzberg-Fränkel (*Ztschr. Induktive Abstam. u. Vererbungslehre, 38 (1925), No. 4, pp. 324–348, figs. 2*).—A résumé of genetic literature indicates the linkage relations found to exist between factors within corn, peas, *Lathyrus odoratus*, *Primula sinensis*, *Antirrhinum majus*, *Matthiola incana*, *Ipomoea* spp., Oenothera, barley, oats, and miscellaneous plant species. The extent of such studies in plants is contrasted with those made in Drosophila.

The age of attainment of sexual maturity in the albino mouse, A. S. Parkes (*Jour. Roy. Micros. Soc., 1925, No. 3, pp. 315–319, pls. 2*).—In studies of the age of attaining sexual maturity in the albino mouse, as determined by histological examinations of the ovaries and testicles, animals were killed at 2-day intervals between the ages of 4 and 8 weeks. In the males the suspension of the material in the epididymi in Ringer's solution was also examined microscopically for the presence of spermatozoa.

The results showed that the earliest active sperms were found in the epididymi at 35 days, but the more common time of first appearance of active spermatozoa was during the sixth week. The condition of the animals appeared to influence the vigor of the spermatozoa. The study of the sections of the testicles correlated well with the results of the epididymi examinations. In the females the young examined at 24 days of age showed follicles in various stages of development, but none were mature. With increased age there was a greater development of follicles, and at 56 days fully developed follicles were found.

It was concluded that the first ovulation takes place during the eighth week under ordinary conditions, but in one animal young corpora lutea were actually present at 50 days. Studies of a number of uteri indicated that they were immature at 40 days, but during the eighth week considerable development occurred. This indicates that normal pregnancy may follow the first ovulation in the female, but it appears that the development of the sex instinct in the male is not always as early as spermatazoa are produced.

[Studies of the physiological action of the ovarian follicular hormone] (*Abs. in Anat. Rec., 29 (1925), No. 5, pp. 379, 380*).—In continuing the studies of the physiological action of the ovarian follicular hormone at the Missouri School of Medicine and the Washington University School of Medicine (E. S. R., 53, p. 834), the results of two studies are briefly noted:

The effect of injections of the ovarian follicular hormone and active extracts of human placenta upon pregnant and lactating rats, their embryos and young, E. Allen, B. F. Francis, and O. W. Craig.—Injections of the ovarian follicular hormone into pregnant female rats induced a maximum reaction in the genital tract on the sixth day of pregnancy without itnerference with normal gestation, but injections on the eighth and twelfth days produced less marked reactions and those during the latter third of gestation were without effect. Double ovariectomy of the pregnant females before injection did not alter the reaction, indicating that these bodies do not inhibit the action of the hormone. Histological studies of the organs of the embryos from injected females indicated that no effect had resulted from the injection.

The relation of thyroids and parathyroids to the reaction of the genital tract to injections of the ovarian follicular hormone, E. Allen, J. W. Whitsett, and J. W. Hardy.—It was found that rats from which thyroids and parathyroids, as well as ovaries, had been removed reacted normally to injections of the ovarian follicular hormone.

Oestrous cycle in the domestic cow (Bos taurus). Effects of ovarian extracts (sixth report), H. S. Murphey, G. W. McNutt, B. A. Zupp, and W. A. Aitken (*Abs. in Anat. Rec., 29 (1925), No. 5, p. 370*).—At the Iowa State College sterile follicular fluid diluted with physiological salt solution was administered intravenously to spayed cows, spayed bitches, pregnant cows, and sterile cows. The results showed that certain indications of heat were produced in the spayed cows and spayed bitches, but this was not complete. Heat was produced in the pregnant cows and coitus accepted. Fifty per cent of the sterile cows showing no abnormalities or disease became pregnant. Sterile physiological salt solution extracts of corpora lutea of different ages appeared to have no effect on the normal oestrous cycle.

The oestrous cycle in the rabbit, G. J. Wood (*Abs. in Anat. Rec., 29 (1925), No. 5, pp. 399, 400*).—Histological studies of the secretions of the vagina and the vestibulum in the New Zealand Red rabbit indicated that the oestrous changes are similar to those in the other rodents. The oestrous cycle is approximately 10 to 13 days in length. There is first a sudden diminution of the polymorphonuclear leucocytes, followed by the appearance of squamous and columnar epithelial cells. Cornified cells become mixed with the various epithelial cells about 12 hours later. After 24 hours leucocytes are prevalent in large numbers. The vaginal canal contains an abundance of fluid during the first two stages, which is at first quite mucous in character.

FIELD CROPS

[Field crops experiments in Arkansas] (*Arkansas Sta. Bul. 203 (1926), pp. 7–21, 43, figs. 2*).—In endeavors to alter the oil and protein contents of

cotton seed, high protein strains showed an increase of about 5 per cent above the average protein content, while their oil contents remained near the average. The low protein group did not depart far from the average for cotton seed but the oil content therein tended to increase. The increase of oil content in the high oil group was less marked than the increase of protein. Reduction of oil content appears to be accomplished more easily than increase. The protein content tends to rise as the oil content is reduced, whereas it remains quite constant during efforts to increase the oil content.

Cotton rows on either side of a row of red cotton received about 1 per cent of mixture, and cotton two rows from the red cotton about 0.5 per cent, while the degree of natural crossing in more distant rows was practically negligible. Spacing experiments with cotton have given rather variable results. The thicker plantings appear to show a decided advantage in seasons of numerous boll weevil, and they also save labor, which seems to justify thick planting, even without boll weevil infestation. Improved strains of Trice, Foster, Express, and Triumph cotton are described.

Outstanding among corn varieties have been Paymaster in north Arkansas, Delta Prolific, a relatively new variety developed for adaptation to the Delta and lowlands in eastern Arkansas, Mosby Prolific for the better lands of southern Arkansas, Thibault Mexican June for central Arkansas, and varieties of Texas origin, such as Sure Cropper, Ferguson Yellow Dent, and Chisholm, in southwestern Arkansas. The average corn yields for a period of years from different cultivation treatments were remarkably similar, medium cultivation, i. e., to a depth of 3 or 4 in., giving a small increase over other methods. Delaying cultivation until 6 and 8 weeks after planting resulted in decided yield decreases, even though clean and thorough cultivation was given thereafter. The effect of laying by at different stages of development appears to depend largely upon weed growth after cultivation stops. Results at Fayetteville show a decrease in yields of all corn varieties from early planting to late planting, while at Scotts the later plantings of the same varieties yielded better than early plantings. Planting 1 hill of legumes between corn hills reduced the corn yield only slightly, 2 hills between the corn about 2 bu., and 4 hills between the corn reduced the yield about 8 to 10 bu. per acre. In all cases cowpeas had the least effect in reducing yield, that of soy beans being more marked, and of velvet beans very much greater. Removal of tillers from the corn plant seemed to be a questionable practice.

The leading varieties of sorgo, winter wheat, oats, rye, barley, soy beans (E. S. R., 54, p. 36), and cowpeas are indicated. Suggested acre seeding rates were for wheat 6 pk., spring oats 10–12 pk., and barley 2 bu.

The sowing of cowpeas with small grains was found entirely impractical. Soy beans generally made a stand but only partly recovered from the setback caused at grain harvest. Hubam clover made a good stand early but dwindled and disappeared later. Alfalfa made a stand but thrived poorly with a nurse crop. Both types of red clover were generally successful, and lespedeza did yet better than red clover. Seeding conditions conducive to best results with clovers were early seeding, seeding on a late snow, seeding on a surface honeycombed by a freeze, and seeding on the fresh soil following the sowing of spring oats. The last method was not wholly successful with lespedeza, which usually did well on winter grains where the surface was compact. Cowpeas were rather consistent yielders of hay, although their average fell somewhat below that of soy beans.

Grimm alfalfa excelled in yields, and with other varieties from northern regions surpassed common strains in hardiness. Frequent cutting gave a higher average yield but had no material effect upon the condition of the

stand. A slight advantage was seen in favor of delayed cutting. After a period of years the weeds on alfalfa cultivated with a heavy spike-toothed harrow after each cutting were nearly as profuse as on an uncultivated portion, and the condition of the stand showed no difference. Application of manure gave an average annual acre increase of 0.73 ton of hay, while comparisons showed that about 75 per cent of the original stand remained without fertilizer treatment, 80 per cent stand with commercial fertilizer, and 90 per cent stand with manure.

Kudzu, bur clover, vetch, Austrian field pea, and lespedeza gave promise for certain conditions in the State, while beggar weed, Hubam sweet clover, Canada field pea, and velvet beans failed to fulfill requirements. The respective average acre increases made by corn grown after cowpeas and soy beans plowed under were 21.6 bu. and 20.1 bu., after these legumes cut for hay 10.9 and 5.2 bu., and after the legumes following oats and plowed under 16.4 and 7.6 bu. Plowing under velvet beans and sweet clover gave much smaller increases. No positive differences between growth on the limed and unlimed portions of a slightly acid field were shown by any legume excepting sweet clover, four types of which almost failed on the unlimed part, while a satisfactory stand and growth was obtained on the limed portion. Nodules were seldom more profuse where the lime had been applied.

The progress of tests with pasture grasses is reported briefly, Bermuda appearing to give most promise. Mixing clover with orchard grass seemed entirely practical for hay crops but not desirable for seed crops of orchard grass. While no method of seeding orchard grass was a failure, spring seeding was much more reliable than fall seeding on account of moisture conditions. Seeding without a nurse crop gave better results in the first and subsequent years than where a nurse crop was used. Commercial fertilizer had little effect where the seeding was made on good land.

With potatoes, combinations of phosphorus and nitrogen in an 8–4–0 formula and applying all of the fertilizer under the row at planting gave the best results. Over 400 to 500 lbs. per acre did not prove profitable for row application. Certified seed from northern sources were superior to common seed stock and to the fall crop of seed produced in the State.

From 400 to 500 lbs. of a mixed fertilizer containing little or no potash have given the best results on sweet potatoes. Phosphorus was the only single element showing a gain when used alone. Profitable returns were had from fertilizers only when phosphorus and nitrogen were used in combination. Applying all of the fertilizer under the row before planting gave the best results, while double application or side dressings were not profitable. Close planting reduced the number of jumbos, and the same result could be had by late planting. Fertilizers on the plant bed have failed to increase production of slips.

[Agronomic experiments in New Jersey], L. G. Schermerhorn, G. W. Musgrave, J. G. Lipman, and A. W. Blair (*New Jersey Stas. Rpt. 1924, pp. 77, 78–80, 81, 197–223, 227–231, 252–259, 260, 261, fig. 1*).—Continued investigations (E. S. R., 52, p. 732) embraced fertilizer trials with potatoes and with sweet potatoes (*E. S. R., 52, p. 534*); seed studies with corn and potatoes; variety tests with wheat, oats, barley, timothy, alfalfa, and miscellaneous forage crops; studies of the amount, proportion, and growth rate of top and root in rye and vetch cover crops; and breeding work with corn, potatoes, and sweet potatoes. Comment is made on varieties and seeding and fertilizer practices with soy beans in the State.

With prices prevailing as in the period 1913–1921, the 1.5-oz. potato seed piece, while giving a larger gross and net yield, did not give a larger return than the

1-oz. seed piece. When the spread between the two prices is greater than indicated, the larger seed piece may be profitable. In cooperative fertilizer experiments with potatoes on Sassafras loam a 6-year average showed a gradual increase from 214 bu. with 800 lbs. of a 4-8-3 formula to 276 bu. with 2,800 lbs., while the unfertilized check averaged 166 bu. Potatoes treated with ammonium sulfate yielded 30 bu. per acre less than the lowest yield with sodium nitrate, fish scrap, or tankage. However, potatoes from the sodium nitrate plats were very much injured by the scab, while the reverse was true on ammonium sulfate plats. When half the nitrogen was from sodium nitrate and half from one of the other materials, yields were distinctly larger than when the materials were used singly. Comparison of formulas indicated that on this or similar types of soil 6 per cent of potash (4-8-6) is about enough when as much as 1,600 lbs. of fertilizer per acre is applied. While greensand marl gave a fair increase, its bulk would probably make application expensive, and tubers were very scabby on marled plats. Limestone seemed to depress yields.

Commercial varieties of alfalfa, R. A. Oakley and H. L. Westover (*U. S. Dept. Agr., Farmers' Bul. 1467 (1926), pp. II+22, figs. 8*).—This is a revision of Farmers' Bulletin 757 (E. S. R., 35, p. 830).

Hardy alfalfa varieties best for Michigan, J. F. Cox and C. R. Megee (*Michigan Sta. Quart. Bul., 8 (1926), No. 3, pp. 107–110, figs. 2*).—In comparative tests the Hardigan, Grimm, Cossack, and Ontario Variegated strains were winter hardy, high yielding, and exceedingly well adapted to Michigan conditions. While a few common strains when seeded under favorable conditions will give fair yields, they are not as dependable as the strains mentioned. Arizona Common, Hairy Peruvian, and other southwestern strains and strains imported from Argentina and from South Africa are entirely unsatisfactory for seeding under Michigan conditions because of their lack of winter hardiness and low yields.

The nitrogen content of alfalfa, M. M. McCool (*Michigan Sta. Quart. Bul., 8 (1926), No. 3, pp. 122–124*).—When cut at short intervals, the nitrogen content of the tops and of the roots of Grimm alfalfa was greater at all periods than that of Cossack or common. Tops of Cossack with one exception contained more nitrogen than did the common alfalfa. As in previous experiments, the nitrogen content of the tops was greater in the early development stages than in the later. In most instances the samples of roots of common alfalfa contained less nitrogen than the Cossack.

Alsike clover, C. J. Willard (*Ohio Sta. Bimo. Bul., 11 (1926), No. 2, pp. 43–46*).—The comparative yields and nitrogen content of alsike and red clover are tabulated from experiments at the Ohio State University. Alsike did not appear to be materially inferior to red clover in its root system, and the nitrogen content of both the roots and tops of the two clovers at corresponding stages is very similar, although both are inferior in this respect to sweet clover and alfalfa. Among the good qualities of alsike are endurance to poor drainage, indifference to acid soils, and marked winter resistance. It is much less subject to heaving than sweet clover, alfalfa, and red clover. There seems to be no problem of regional adaptation with alsike as there is with various strains of red clover. The most serious objections to alsike in Ohio are its lodging habit and its early maturity. Its particular place in the State appears to be in mixtures.

Red clover seed for Pennsylvania, C. F. Noll and C. J. Irvin (*Pennsylvania Sta. Bul. 200 (1926), pp. 15, fig. 1*).—Comparisons of native red clovers with strains from Europe, Canada, and Chile during five crop years gave rather inconsistent results. Considerable variation was noted in the behavior of

clover from the same country. Excepting Italian seed, the imported seed compared favorably with the average of American-grown seed. In the parts of Pennsylvania well adapted to red clover, the French, north European, and Chilean seed will probably give as good average yields of hay as domestic seed. However, in years of severe winter injury clover from American-grown seed will likely prove most hardy. American-grown seed is recommended for parts of Pennsylvania in which clover frequently fails. Results of similar tests in other States are summarized.

Subterranean clover, a new sandy-land grazing crop for southeastern Texas, A. H. LEIDIGH (*Texas Sta. Circ. 37 (1925), pp. 12, figs. 4*).—The characteristics, adaptation, seed production, and cultural requirements of *Trifolium subterraneum* are described, with the results of trials in southeastern Texas.

Subterranean clover, a fall-sown pasture plant adapted to spring grazing and very successful in Australia, appears to be adapted to a region of moist, mild winters. It may be seeded alone or on Bermuda sod or in mixtures with rescue grass or rye grass at acre rates of from 1 to 10 lbs. The crop should not be overpastured in the winter, and new areas should be protected until the plant is established, after which it may be expected to reseed itself yearly. Under conditions in southeastern Texas, at least 200 lbs. of acid phosphate per acre should be applied just before or immediately after seeding and probably 100 lbs. per year thereafter.

Cotton experiment, 1925: Fertilizers and varieties, J. F. O'KELLY and W. W. HULL (*Mississippi Sta. Bul. 230 (1925), pp. 3–14, figs. 4*).—Fertilizer experiments at the station and in cooperation with farmers suggested for cotton in east-central Mississippi a mixture of 8 parts of phosphoric acid, 6 of nitrogen, and 4 of potash where cotton rusts or where more fertilizer than 600 lbs. per acre is used. Potash may be omitted if cotton does not rust and the application is light. While 600 lbs. or more of fertilizer per acre should generally be applied, the rate will depend on the natural soil fertility, previous fertilization, and preceding crops.

During the period 1921–1925, Cleveland strains, Cook, and Half-and-Half made the highest average yields at the station (E. S. R., 53, p. 234), and Miller, Delfos, and Trice led in average acre value. D. & P. L. selections, Deltatype Webber, Miller, and Delfos 631 ranked high in acre value among the standard varieties tested in 1925. The greatest acre values in a test for wilt resistance were given by Miller, Watson, Solomon and Oates Big Boll, and Kelly Big Boll. Other varieties indicated as wilt resistants were Cook (Rhyne), Cook 307–6, and Dixie Triumph.

Rotation and hogging-off experiments with field peas, E. G. SCHAFER and R. T. SMITH (*Washington Col. Sta. Bul. 198 (1926), pp. 4–21, figs. 2*).—Experiments reported dealt with the influence of field peas on succeeding crops in rotations and the comparative yields of field pea varieties. Cultural suggestions are outlined briefly. Data on the utilization of the crop by hogs are given in greater detail than in a previous note (E. S. R., 54, p. 861).

Wheat following field peas yielded less than after good summer fallow and more than when preceded by corn or sunflowers. A larger total yield of grain was obtained during equal periods in rotations in which field peas replaced summer fallow. Field peas following wheat in four different rotations in which that crop succession occurred averaged 22.7 bu. per acre, whereas spring wheat after wheat in four rotations averaged 21.9 bu. Bangalia, Canada, and Alaska field peas with relative yields of 30.7, 28.5, and 27.5 bu. per acre, respectively, are indicated as outstanding varieties.

Seed potatoes for northern Ohio, J. BUSHNELL (*Ohio Sta. Bimo. Bul., 11 (1926), No. 2, pp. 60–64, fig. 1*).—In tests of certified seed potatoes Rural

Russets from Michigan on the average outyielded White Rurals from other Northern States. Much of the seed certified in Ohio is of later maturing types than the standard in the Northern States. Such later-maturing strains in three out of four seasons outyielded Russet Rural from Michigan. In tests with tubers hill-selected from a crop grown from certified seed, the seed was very satisfactory in two seasons and in the third was highly diseased.

Experiments in rice culture at the Biggs Rice Field Station in California, J. W. Jones (*U. S. Dept. Agr. Bul. 1387 (1926), pp. 39, figs. 8*).—Supplementing previous reports (E. S. R., 49, p. 433; 51, p. 638), soil and meteorological conditions at the Biggs Rice Field Station are described, and the results of seeding, weed control, irrigation, and varietal and crop-sequence tests with rice are summarized.

The best method of irrigation on foul land seems to consist of continuous submergence after broadcasting the rice on the soil. Probably rice should be sown at a heavier rate when grown by continuous submergence than when grown by deferred submergence by the old method of irrigation. Seeding experiments with 3 varieties suggested the rate of 150 lbs. per acre when rice is grown on old land by the old method. Broadcasting comparatively early was indicated.

In experiments on seed-bed preparation for rice grown by continuous submergence the best yields were had on well-prepared land on which the rice was broadcasted and immediately submerged 4 to 6 in. On unprepared or poorly prepared seed beds such weeds as spike rush, cat-tail, and slender aster reduce rice yields below profitable limits. On land foul with cat-tail, a heavy rate of seeding (200 lbs. per acre) did not help to eradicate the weed, but good stands of rice do help to prevent cat-tail from becoming established on a clean rice field. Continuous cropping tests indicated that profitable rice yields can not be made longer than 6 years in succession by the old methods of irrigation, even when weeds are controlled, and that continuous cropping probably will not be practicable when irrigating by continuous submergence.

The varietal experiments showed that medium-grain and long-grain rices are not so well adapted to California conditions as the short-grain rices. Agronomic data are tabulated for 6 varieties grown during the period 1918–1924. Of varieties and selections of early, midseason, and late short-grain rices grown on small increase plats from 1920 to 1924, inclusive, midseason selections made the highest average yields and the late group ranked second. Varieties grown on bur clover land averaged 1,778 lbs. more per acre, or 38 per cent, than when grown on mung bean and soy bean land. Bulk rows produced higher average yields per row than head rows in the rice nursery, apparently because of heavier seeding. In general, midseason and late short-grain varieties and selections gave higher average yields in the nursery than the medium or long-grain types.

The influence of lime on soybeans, J. G. Lipman and A. W. Blair (*New Jersey Stas. Rpt. 1924, pp. 259, 262*).—In the eleventh year of continuous growing of soy beans on the same land (E. S. R., 52, p. 735) the data seemed to permit the conclusion that soy beans may be grown on the same land year after year without the use of nitrogenous fertilizers and the crop removed without seriously depleting the supply of soil nitrogen. However, lime, phosphate, and potash should be applied at regular intervals to offset losses through leaching and removal of crops.

Commercial sugar beet seed, J. G. Lill (*Michigan Sta. Quart. Bul., 8 (1926), No. 3, pp. 110, 111*).—The stand, the yield, the sugar content, the purity,

and the pounds of sugar per acre produced by the beets grown from each of 35 brands of commercial sugar-beet seed during 1925 are tabulated.

Experiments with sun-cured tobacco and other crops grown in rotation with it, W. W. Green (*Virginia Sta. Bul. 242 (1925), pp. 15, fig. 1*).—Problems studied at the Bowling Green Substation 1912–1920, supplementing previous work (E. S. R., 27, p. 436), were the effects of lime and fertilizers on tobacco and crops commonly grown in rotation with it and variety tests.

Experiments in a 5-year rotation of tobacco; wheat; clover, timothy, and redtop for hay; corn followed by crimson clover; and cowpeas indicated that a complete fertilizer containing a high percentage of phosphoric acid is essential to producing maximum yields of good quality tobacco. Phosphoric acid is first and nitrogen second in importance, although potassium is also essential in producing heavy yields of good quality tobacco. Tobacco is greatly dependent on a liberal supply of readily available phosphoric acid.

For sun-cured tobacco satisfactory sources of nitrogen would be half from sodium nitrate and half from ground tankage. With limed soil ammonium sulfate could replace some of the sodium nitrate if the nitrogen therein costs less per pound. The selling price of the tobacco was always higher where lime was used. Lime was quite beneficial where ammonium sulfate was used and of slight value with sodium nitrate. The recent work has not shown potassium sulfate to be superior to potassium chloride for sun-cured tobacco. Since this tobacco is used largely for chewing, any adverse effect that potassium chloride would have on the burning quality is unimportant.

The investigations suggest the application of from 1,000 to 2,000 lbs. of 8–3–4 or 8–4–5 fertilizer to the acre for sandy soils unmanured, and about 1,000 lbs. of 8–3–3 fertilizer on the heavier types of soil or where much manure is applied before the tobacco. Heavy applications of well-balanced fertilizers did not cause tobacco to fire or burn on the hill.

Declining yields in rotations were apparently due to black root, possibly caused by growing cowpeas directly before tobacco. The increased yields in the rotation where fertilizer was heavily applied were probably as much due to the improved physical condition of the soil as to the plant food. A fair profit with most crops in the rotation was caused by the use of lime, the increase being enough where complete fertilizers were used to justify the cost of liming except where calcium cyanamide was applied for the nitrogen. The residual effect of fertilizer to tobacco on the subsequent crops in the rotation is commented on briefly.

The Orinoco variety appears best suited to producing the sun-cured product. Narrow Leaf Orinoco has been most satisfactory, considering both yield and price, and Little Orinoco is also desirable. Green Wildfire Resistant Orinoco showed decided resistance to the leaf diseases, yields well, cures easily, and is probably the most extensively grown for sun curing at this time.

Comparative hardiness of winter-wheat varieties, J. A. Clark, J. H. Martin, and J. H. Parker (*U. S. Dept. Agr., Dept. Circ. 378 (1926), pp. 19, fig. 1*).—Varieties and strains of winter wheat were grown in uniform nurseries at 26 experiment stations in the United States and Canada during one or more years of the period 1920–1925, 11 varieties being grown throughout the period. Comparative hardiness data obtained during 72 station years showed Minhardi, Buffum No. 17, Minturki, and Odessa to be considerably more cold resistant than Kharkof, the standard used. Padui, Turkey (Minn. No. 1488), and Beloglina also seemed to be somewhat more hardy than Kharkof, and Kanred and Nebraska No. 60 are probably slightly hardier. On the other hand, Nebraska No. 28 and Blackhull were much less winter hardy than Kharkof.

Spring wheat in Ohio, C. E. Dike (*Ohio Sta. Bimo. Bul., 11 (1926), No. 2, pp. 47-49*).—The comparative yields of spring wheat, winter wheat, barley, and oats at the station and at district and county experiment farms are tabulated, with information on the culture and utilization of spring wheat.

HORTICULTURE

[Horticultural investigations at the Arkansas Station] (*Arkansas Sta. Bul. 203 (1926), pp. 40-42, 43, 44*).—Studies in apple pollination showed Arkansas, Winesap, Stayman Winesap, and Arkansas Black to be not only self-sterile but for the most part inter-sterile. When pollinized with Jonathan, Grimes, Delicious, Ben Davis, and Champion (Collins) these varieties set abundantly. Varieties whose pollen tubes grew rapidly in laboratory tests were found to be satisfactory pollinizers in the orchard. Consistent differences were observed in the number of aborted seeds and undeveloped ovules in apples resulting from various crosses. Apples with a large number of seeds hung better to the tree and averaged larger in size than those with few seeds.

Microscopic examination of fruits at various stages in their development showed that the ovules were fertilized in all except those which fell within a few days after the petals. The fruits to drop first are those with few seeds, those on weak spurs, and those in the dense shade of the tree. Fruit-bud production was found to be closely correlated with vigor. Trees maintaining an average growth of from 6 to 8 in. usually bore heavily, while those with more or less growth bore irregularly. Soil fertility, pruning, and water supply are deemed to be contributing factors to the trees' welfare.

Of three elements, nitrogen, phosphorus, and potash, nitrogen alone showed value, not only in increasing the set of fruit but also the number of spurs to form fruit buds for the succeeding year. Phosphorus had a favorable influence on the cover crop. In a young cover-cropped orchard no benefit was obtained from the use of nitrogen.

With the peach, both phosphorus and potash when used with nitrogen showed some benefit in yields. Neither phosphorus nor potash influenced color, firmness, or shipping quality of peaches. The beneficial effect of nitrogen on peach yields rested in increased bud-bearing wood and in increasing the percentage of set. The time of applying fertilizers in peach orchards is considered less important than in the case of the apple. The Carman and Japan Dream peaches, whether selfed or crossed, produced no viable seed.

No beneficial effect of fertilizer has been recorded for the grape. Data taken on grapevines showed the total yield and average weight per cluster to increase from the first to the third bud and range at about the same level to the ninth or tenth buds. The advisability of spurring laterals rather than entirely removing them was indicated in 76.8 per cent productivity in one-bud laterals, as compared with 35 per cent for the basal buds. As fertilizer for cantaloupes, only those materials containing phosphorus were found profitable.

[Horticultural investigations at the Indiana Station] (*Indiana Sta. Rpt. 1925, pp. 29-31, 32, fig. 1*).—Contrary to the results recorded for the preceding year (E. S. R., 53, p. 139), the application of nitrate of soda to tilled apple trees noticeably increased yields. Presumably, cover crops without fertilizers failed to supply sufficient organic matter. Straw-mulched trees for the first time outyielded tilled trees. The thinning out of the heads of 7-year-old apple trees which had not been pruned since planting reduced their yielding capacities as compared with those of similar unpruned trees. Pruning of cultivated unfertilized peach trees in a no-crop year resulted in such heavy growth that summer thinning was required in order to allow the entrance of

sufficient light. Measured in fruit-bud production, thinning out was a better practice than cutting back. Observations on strawberry varieties following a series of freezes in April and May showed the Premier to be an especially hardy variety. The Gibson and Chesapeake varieties also showed hardiness.

Observations in storage cellars in southern Indiana showed that without artificial refrigeration these are not sufficiently cool in September and October to preserve fall-ripening varieties such as Grimes and Jonathan. Work in sweet corn improvement has resulted in the development of a productive, uniformly maturing strain of Country Gentleman.

[**Horticultural investigations at the New Jersey Stations**] (*New Jersey Stas. Rpt. 1924, pp. 48–50, 52–66, 70–77, 78, 80, 82–103, pls. 3*).—A study by A. J. Farley of the comparative cost of dusting and spraying in a commercial peach orchard at Bridgeton showed that, under the conditions obtaining, dusting was much more economical both in respect to labor and money. In respect to disease and insect control, dusting, with the exception of the dormant application, was practically as effective as spraying. Fruit thinning investigations conducted by Farley at Bridgeton upon young Carman and Belle of Georgia peach trees showed that there is a relatively long period during which thinning may be successfully carried on. Heavy thinning increased the proportion of large peaches without materially decreasing total yields. The assumption that peaches should be thinned before the pits harden was not borne out in the studies. Thinning to be most successful should be based on the variety and the individual orchard conditions. Blooming data for various apple, peach, and small fruit varieties are presented in tabular form.

As reported by T. C. Rogers, Aberdeen, Howard 25, and Wyona strawberries were promising new varieties.

That the 1923 season was particularly favorable for peach breeding was indicated in a statement by C. H. Connors that 1,222 seedlings were obtained as a result of the season's activities. Elberta and J. H. Hale were used extensively as ovule parents. Of seven seedlings obtained in a cross of Elberta and a purple-leaved peach all bore purple leaves. Several of the promising seedlings are briefly described, and notable accessions to the peach variety collection are listed.

Following up earlier work (E. S. R., 52, p. 143), in which it was shown that flower color in hydrangea is influenced by soil acidity, Connors reports on an attempt to induce blue flowers by adding various amounts of aluminum sulfate, ammonium aluminum sulfate, and sulfur to a fertile, neutral potting soil. In large applications, 10,000 and 20,000 lbs. per acre (6 in. deep), the ammonium aluminum sulfate proved fatal. Aluminum sulfate was slightly toxic in 10,000-lb. applications, but results with 5,000-lb. doses indicated successful color control. As a preliminary step to determine the fundamental reasons for color changes in hydrangeas, plants were grown in sand cultures of known fertility and acidities. Working with carnation cuttings, Connors found that preliminary treatment of the soil with potassium permanganate solution, 1 to 1,000, stimulated rooting. The beneficial effects of the permanganate are believed to lie in its oxidizing rather than its fungicidal qualities.

Records taken by L. G. Schermerhorn upon a sweet corn fertilizer test showed the highest yields of marketable ears from the plats receiving 4–10–2 fertilizer. Asparagus yields for 1923 showed the value of supplementing manure with chemical fertilizers. Striking differences in yield and in time of maturity were obtained in favor of muskmelons started under glass as compared with those sown directly in the field. The high yields of melons obtained on the cover-crop and commercial fertilizer plats suggest that manure

may be effectively replaced. Tabulated data are presented on the influence of nitrate of soda on tomato, sweet corn, and pepper yields.

Observations by H. F. Huber upon 40 lots of spinach growing at Athenia showed the disease-resistant Savoy (E. R. S., 46, p. 538) to be a valuable variety for autumn cropping. A combination of manure and commercial fertilizer gave larger spinach yields than did fertilizer alone. Fertilizer studies with cauliflower indicated that this crop requires heavy fertilizing in order to insure profitable yields. The best results were secured with 1,000 lbs. of 4-3-4 supplemented with two extra applications of nitrate of soda. Neither manure nor acid phosphate used alone gave profitable results. Sharp differences were recorded in the yields of strains of cauliflower and also of lettuce.

Sprays, their mixing and the compatibility of various mixtures, R. H. Robinson (*Oregon Sta. Circ. 68 (1926), pp. 3-11*).—Pointing out that severe foliage and fruit injury may result from the use of improperly prepared sprays or incompatible combinations, the author recommends several methods of mixing various sprays and spray combinations. A table is presented showing the procedure for mixing various materials.

Analyses of materials sold as insecticides and fungicides during 1925, C. S. Cathcart and R. L. Willis (*New Jersey Stas. Bul. 424 (1925), pp. 5-16*).—This bulletin contains the results of analyses of samples of insecticides and fungicides collected during the inspection for 1925.

Bermuda onion culture in Missouri, J. T. Quinn (*Missouri Sta. Circ. 140 (1926), pp. 8, figs. 4*).—General information is presented in this pamphlet upon varieties, culture, harvesting, grading, etc.

Frost protector for early planting, II, R. P. Hibbard (*Michigan Sta. Quart. Bul., 8 (1926), No. 3, pp. 137-141, fig. 1*).—In a further test of plant protectors (E. S. R., 53, p. 341), all types, celluloid, waxed paper, glassine, light parchment, heavy parchment, and celloglass were effective in saving tomato plants set out May 8 from killing frost occurring on May 18. However, the various protectors had markedly different effects on the performance of the plants. At the time of removal of the cones the plants under glassine and celluloid were bushy in form, healthy green in color, and had commenced blossoming. The glassine-covered plants not only yielded the first ripe fruit but also the greatest amount of ripe fruit. The celloglass plants were approximately four weeks later than the glassine in ripening their first fruits.

Nitrogen fertilizers for fruit trees, H. D. Hooker (*Missouri Sta. Circ. 139 (1926), pp. 8*).—Beginning with a brief outline of the principles of fruit-tree nutrition, the author discusses the effects of nitrogen fertilizers on the apple tree, suggests sources of nitrogen, and gives information concerning the time, size, and method of application.

Spraying program for the orchard and fruit garden, H. C. Young, J. S. Houser, and F. H. Ballou (*Ohio Sta. Bul. 393 (1926), pp. 3-26, figs. 2*).—Accompanied by general suggestions concerning spraying and dusting, data on susceptibility of various apples to diseases and spray injury, information on spreaders, and suggestions regarding the paradichlorobenzene treatment for peaches, spray programs are suggested for bearing and nonbearing apple orchards, pears and quinces, peaches, plums, cherries, grapes, and brambles.

[Spray calendars for New Jersey fruits] (*New Jersey Stas. Circs. 180 (1926), pp. 4, fig 1; 181, pp. 4, figs. 3; 182, pp. 4, fig. 1; 183, pp. 3, fig. 1*).—This series of spray calendars, prepared jointly by the departments of entomology, plant pathology, and pomology, covers the following fruits: Apples and quinces, peaches, plums and cherries, and grapes. These circulars are designed to supersede similar earlier noted pamphlets (E. S. R., 53, p. 37).

Fruit varieties in Ohio, I, J. H. GOURLEY and C. W. ELLENWOOD (*Ohio Sta. Bul. 391 (1926), pp. 427–438, pl. 1, figs. 6*).—With a view to directing attention to promising new varieties in the extensive station collections, descriptive and historical information is given for four apples, namely, Ensee, Gallia Beauty, Summer Rambo, and Baltimore, and one grape, the Caco. Gallia Beauty, because of its attractive red color, is deemed likely to replace the Rome Beauty, its probable parent.

Honeysuckle eradication in Virginia apple orchards, R. H. HURT (*Virginia Sta. Bul. 244 (1926), pp. 8, fig. 1*).—Experiments conducted in the Piedmont section of Virginia in 1924 and 1925 indicated that the common or Japanese honeysuckle can be successfully eradicated from orchards by spraying the honeysuckle foliage with waste engine oil or with lighter oils, such as straw oil or Diamond paraffin. Three applications, namely, late May, middle July, and the succeeding spring, killed the vines, apparently by starving the roots through allowing no leaves to develop. Salt solutions failed to give satisfactory killing. The cost of oil treatments is sufficiently economical to allow extended application.

Importance of bees in the J. H. Hale peach orchard, V. R. GARDNER and S. JOHNSTON (*Michigan Sta. Quart. Bul., 8 (1926), No. 3, pp. 134–137, fig. 1*).—That insect carriers of pollen are important factors in successful pollination of the J. H. Hale peach was shown in an investigation conducted near South Haven. Records taken on two J. H. Hale peach trees inclosed with two Elberta trees in a screen wire cage in which was placed a hive of bees showed 39 per cent of the blossoms maturing fruit, as compared with 13.7 for J. H. Hale trees in a row adjacent to Elberta and 8.1 per cent for J. H. Hale trees selected at random in a six-row block. The inclosed Elberta trees set no better than those outside, indicating that insects are of no great importance with this and other self-fruitful peach varieties.

The small fruits of New York, U. P. HEDRICK, G. H. HOWE, O. M. TAYLOR, A. BERGER, G. L. SLATE, and O. EINSET (*New York State Sta. Rpt. 1925, pt. 2, pp. XI+614, pls. 95*).—This, the seventh in a series of monographs (E. S. R., 48, p. 537) devoted to fruits grown in New York State, deals with the raspberry, blackberry, dewberry, currant, gooseberry, and strawberry. Unlike the preceding volumes of the series, cultural considerations are not discussed, but considerably more stress is placed upon the botany of the several fruits. The splendid color reproductions of the more important varieties enhance the value and general attractiveness of the volume. The accurate and painstaking descriptions, accompanied by historical information, render the work of inestimable value. In accord with earlier volumes, brief biographical sketches of important early small-fruit breeders are included.

Report of the Cranberry Substation [New Jersey], C. S. BECKWITH (*New Jersey Stas. Rpt. 1924, pp. 300–303, 305*).—Further records (E. S. R., 52, p. 740) taken upon the effect of nitrogen upon cranberries growing on Savannah land again showed that nitrogen, especially in the form of nitrate of soda, is valuable in increasing yields. On Savannah soil applications of 264, 528, 792, and 1,056 lbs. of complete fertilizer, 4–15–5, gave respective increases over neighboring checks of 87, 152, 167, and 173 per cent. An examination of individual cranberry plants showed that the increased yields were due to several factors, namely, size of fruit, number of fruits per tip, and increased number of tips.

Rock phosphate applied to cranberries growing on muck land gave slightly increased yields. Records taken on cranberry plats located on muck soil, which

were fertilized in 1920 with various combinations of materials, showed beneficial effects for the first time. Potash was of no apparent benefit, while a combination of nitrogen and phosphoric acid gave satisfactory results. Very large applications of fertilizer decreased yields. Records taken on limed plats showed that ground limestone is of little benefit to the cranberry.

Observations upon the effects of holding the water table at various levels indicated that the water should be held at least 12 in. below the ground surface. At 0, 3, 6, 9, 12, and 15 in. depths the percentages of decayed berries were 35.7, 27.3, 25, 16.2, 7.2, and 9, respectively.

Field production of Ettersburg 121 strawberry: Report of field survey, C. E. Schuster (*Oregon Sta. Circ. 67 (1926), pp. 3–14, figs. 2*).—The importance of the Ettersburg 121 variety as a canning strawberry, coupled with its failure to grow satisfactorily under all soil conditions, led to a study of commercial plantings. Lack of cross-pollination was not found to be a limiting factor, since pure stands cropped just as well as interplanted beds. The variety apparently requires a heavy soil such as occurs in the Willamette and Chehalis series. Much damage is ordinarily done to Ettersburg beds by deep cultivation, which tends to destroy the feeding roots.

Spraying citrus fruits in Porto Rico, M. T. Cook and H. L. Dozier (*Porto Rico Dept. Agr. and Labor Sta. Circ 88 (1925), pp. 23, figs. 5*).—Indicating the principal fungus and insect enemies of citrus fruit in Porto Rico, the authors suggest preventive and combative treatments, discuss spraying methods, and outline the preparation of Bordeaux and oil emulsions.

The pecan in Arizona, A. F. Kinnison (*Arizona Sta. Timely Hints for Farmers, No. 154 (1925), pp. 22, figs. 8*).—This pamphlet contains general information on pecan culture, with suggestions regarding soils, propagation, planting, cultivation, pruning, control of pests, etc.

FORESTRY

Michigan manual of forestry, I, II, F. Roth (*Ann Arbor, Mich.: George Wahr, 1925, 2. ed., rev., vols. 1, pp. IX+239, figs. 12; 2, pp. V+176, figs. 7*).—A revision of an earlier noted work, volume 1 dealing with Forest Regulation or the Preparation and Development of Forest Working Plans (E. S. R., 32, p. 46), and volume 2 with Forest Valuation (E. S. R., 35, p. 240).

The use of growth charts in place of yield tables, T. W. Dwight (*Jour. Forestry, 24 (1926), No. 4, pp. 358–377, figs. 5*).—The author describes a method for estimating future yields of forest trees based on the assumption that the diameter of an individual tree attained at a certain age is a satisfactory index of its capacity for future development under similar conditions.

Wood-using industries of Ontario, II, compiled by R. G. Lewis and A. E. Millward (*Canada Dept. Int., Forestry Branch Bul. 75 (1924), pp. 106*).—This is a resurvey of the industries dealt with in a bulletin published in 1913 (E. S. R., 29, p. 843).

Observations on a lumbered area in Surrey from 1917 to 1925, M. Benson and E. Blackwell (*Jour. Ecology, 14 (1926), No. 1, pp. 120–137, figs. 8*).—Observations on the vegetation and condition of reproduction on an area from which a pure stand of pine was clear-cut in 1916 because of the necessities of war showed the inability of the pine (*Pinus sylvestris*) to take repossession of the area. On the other hand, white birch quickly assumed leadership, necessitating its clear-cutting in 1925 and replanting to pine.

Thinning a white pine plantation, A. K. Chittenden (*Michigan Sta. Quart. Bul., 8 (1926), No. 3, pp. 142–145, figs. 2*).—The removal of approximately one-third of the trees from a 34-year-old white pine plantation removed only one-

fifth of the volume. The necessity for thinning was shown in observations upon the annual growth rings in 30 trees, which showed that diameter accretion had been much slower in the last than in the preceding decade.

The conversion of jack pine to red and white pine, R. M. Brown and H. D. Petheram (*Jour. Forestry, 24 (1926), No. 3, pp. 265–271.*)—Studies of reproduction in jack pine stands of various densities showed that this species reproduces more abundantly and on the average makes a higher percentage of young growth in the more open stands. In open stands jack pine averaged 61 per cent of all reproduction, while in dense stands the percentage was 25. Clear cutting evidently favors the perpetuation of jack pine, and, conversely, partial cutting assists the establishment of more desirable species, such as red and white pines. The authors advise that jack pine should not be entirely removed until the better species are becoming suppressed. In the absence of red or white pine seed trees, planting becomes a necessity.

The chestnut in Algeria [trans. title], L. Trabut (*Gouvt. Gén. Algérie, Dir. Agr., Serv. Bot. Bul. 62 (1925), pp. 16, figs. 2*).—Pointing out that there are large areas in Algeria suitable to chestnut growing, the author discusses culture, propagation, general care, etc.

The useful trees of Northern Nigeria, H. V. Lely (*London: Crown Agents for Colonies, 1925, pp. XII+128, pls. 121*).—This volume, prepared for the purpose of assisting in the identification of the trees of the savannah forests of Northern Nigeria, is illustrated with drawings of the flowers, leaves, thorns, fruits, and seeds.

Annual report on the forest administration of Nigeria for the year 1924, H. N. Thompson (*Nigeria Forest Admin. Ann. Rpt. 1924, pp. 25*).—This is the usual annual report (E. S. R., 53, p. 43).

Progress report of forest administration in the Province of Assam for the year 1924–25, F. Trafford and J. Prasad (*Assam Forest Admin. Rpt. 1924–25, pp. 18+51+2*).—As usual (E. S. R., 52, p. 843), information is presented concerning the year's activities in the management of the forests.

DISEASES OF PLANTS

Foreign plant diseases, J. A. Stevenson (*U. S. Dept. Agr., Off. Sec., 1926, pp. VIII+198*).—This is a manual of economic plant diseases which are new to or not widely distributed in the United States, the information being based on a host index of foreign plant diseases maintained in the Office of Foreign Plant Quarantines of the Federal Horticultural Board. The arrangement is alphabetical for both hosts and causal agents of the diseases, and under each fungus or bacterium listed there is given a brief summary of the symptoms of the disease produced by it, together with its specific hosts and the countries in which it has been reported as occurring. Diseases due to nematodes and to unknown causes supposed to be of an infectious nature are also included.

Plant diseases (*Arkansas Sta. Bul. 203 (1926), pp. 44–51, figs. 3*).—Studies of cotton diseases are said to indicate the presence of more or less distinct strains of the wilt fungus (*Fusarium vasinfectum*) and that environmental conditions are important factors in the incidence of the disease. Tests are said to be in progress to determine varietal resistance to wilt, and the parasite has been found to cause a damping-off of cotton seedlings. Cotton plants placed in filtered extracts of media, in which the fungus had been grown, wilted, indicating that the injury is due to toxic principles and not to the plugging of the vascular bundles of the host.

The disease of cotton caused by *Ascochyta gossypii*, first described from Arkansas (E. S. R., 47, p. 447) but since reported from other States, has been

found to be dependent on weather conditions for its occurrence. Delinting cotton seed with sulfuric acid is claimed to eliminate the probability of angular leaf spot infection.

The Sclerotium stem rot of rice is reported as being a serious disease in the State. Experiments have shown that the disease can be carried mechanically and that it spreads in stubble after harvest. Burning stubble where practicable and crop rotation are recommended for the control of this stem rot. It is claimed that straight head or blight of rice can be prevented by draining the fields five or six weeks after the water is applied and leaving the soil to dry for two or three weeks.

The parasitism of *Armillaria mellea* and *Clitocybe monadelpha* on privet hedges, apple and peach trees, and grape vines is reported.

It is claimed that the organism which causes bacterial stalk rot of corn (E. S. R., 47, p. 243) can survive the winter in infected stalks, and this is said to suggest that rotations of at least two years' duration should be adopted for fields that have become infested.

Further investigations of sweet potato mosaic (E. S. R., 44, p. 345) have shown the infectious nature of the disease, and artificial infections are said to have given data on the period of incubation, carriers, etc.

The occurrence of a bacterial blotch of oats which is distinct from the halo blight is reported.

[Report of Indiana Station department of] botany (*Indiana Sta. Rpt. 1925, pp. 16–19, figs. 2*).—In an investigation of cereal rusts carried on cooperatively with the U. S. Department of Agriculture and several State experiment stations a number of resistant varieties of wheat were found. Among the outstanding ones were several crosses in which Kanred was one of the parent plants. A number of strains of rye, barley, and corn were found that showed resistance to leaf rusts.

In connection with corn-disease studies, plants were grown in pots with the same supply of nutrients at tempeatures of from 18 to 20° and from 25 to 27° C. At the end of four weeks the plants grown at the higher temperatures showed a purple coloration, indicating a lack of phosphorus, and ash analyses showed a difference of over 30 per cent in the phosphorus pentoxide content of the leaves in the two lots, those grown at the lower temperatures having the higher content.

Analyses of healthy and mosaic tomato plants showed a reduction in the diseased plants of 56 per cent in fresh weight and 51 per cent in total carbohydrates.

Report of the department of plant pathology, W. H. Martin et al. (*New Jersey Stas. Rpt. 1924, pp. 373–421, pls. 2*).—Annotated lists are given of the diseases observed during the year on agricultural and ornamental plants.

Potato spraying and dusting in 1923, W. H. Martin (pp. 381–389).—The results are given of cooperative experiments with commercial crops and late-grown potatoes in which comparisons were made of copper-lime dusts and commercial and homemade Bordeaux mixture, and, on the late crop, Bordeaux mixture of varied composition. In the experiment where copper-lime dust was used very little advantage was gained by its application. The use of Bordeaux mixture in every case resulted in increased yields. The addition of Kayso as a sticker and spreader in Bordeaux mixture did not increase the efficiency or sticking quality of the fungicide. In one spray test with late Irish Cobblers two applications of a 10–10–50 Bordeaux mixture gave a yield increase equal to that resulting from four applications of a 5–5–50 mixture. In the same test the increase resulting from the use of Bordeaux mixture prepared with hydrated lime was equal to that obtained where stone lime was used.

Oats smut control studies, W. H. Martin (pp. 390–392).—Comparative tests were made of copper sulfate dip, formaldehyde sprinkle and spray, copper carbonate dust, nickel carbonate dust, Semesan, Kalimat, sulfur, dehydrated copper sulfate lime, and aluminum sulfate for the control of oat smut. When germinated in soil every lot of treated seed gave a higher percentage of germination than the untreated seed. The best control was secured by the formaldehyde sprinkle method, while the results given by the copper sulfate dip and formaldehyde spray methods were approximately as good. The control resulting from the use of nickel carbonate was nearly equal to that of the formaldehyde sprinkle method, and where copper carbonate was used satisfactory control followed. With the exception of the copper sulfate dip and dehydrated copper sulfate-lime treatments, all treated plats gave an average yield greater than the check plats.

Sweet potato disease studies, R. F. Poole (pp. 392–399).—In a previous publication (E. S. R., 52, p. 351) the author gave some of the results of investigations on the control of stem rot caused by *Fusarium* spp. In the present report an account is given of experiments for the control of scurf (*Monilochaetes infuscans*) and pox caused by *Cystospora batata*. Both diseases were increased in field tests where lime was added to the soil and reduced when sulfur was employed at the rate of about 300 lbs. per acre. Laboratory studies showed that *M. infuscans* would not grow at pH 3.2, and only slight growth appeared at pH 4. The maximum growth of the fungus took place at nearly the neutral point of the medium. Field experiments are said to indicate that other factors than increased acidity influenced the reduction of scurf.

Tomato disease studies, R. F. Poole (pp. 400–403).—Cooperative spraying and dusting experiments conducted to determine the relative efficiency of copper-lime dust and Bordeaux mixture for the control of tomato diseases showed that where the infection by leaf-spot diseases was slight the treatments were of little value, but in other experiments where infection was serious the liquid fungicides were more efficient than the dusts, and the standard strength Bordeaux mixture was as effective as the double strength mixture. A considerable rotting of tomatoes was reported after hailstorms, and the following fungi were isolated from injured fruits: *Rhizopus* sp., *Fusarium* sp., *Macrosporium solani*, *Oidium oospora lactis*, and *Bacillus carotovorus*. *B. carotovorus*, *O. oospora lactis*, and *Rhizopus* sp. produced rapid decay, while Fusarium and Macrosporium produced slow dry-rot.

Pea root rot studies, C. M. Haenseler (pp. 403–414).—In addition to the fungi previously reported as occurring on peas (E. S. R., 52, p. 744), the probable presence of *Aphanomyces euteiches* as a cause of serious loss in pea fields is indicated. Pathogenicity tests of 14 species and strains of fungi isolated from rotted pea roots showed one strain of Fusarium, a sterile fungus, and 2 strains of Pythium to be actively parasitic. Soil moisture was found not to be a controlling factor with the sterile fungus, but the maximum infection with Fusarium occurred at a soil moisture content of 40 to 60 per cent saturation. When soil was maintained at 60 to 80 per cent saturation, infection by Pythium was practically complete. Young plants were found less susceptible to attack by Fusarium than older ones, and continued plantings of peas in infested soil increased the proportion of plants affected by the rots. Applications of fertilizer, lime, and sulfur were without effect in controlling pea root rots. Depth of planting was not found to be a factor in the incidence of disease, and tests of varieties and strains did not show sufficient difference in resistance to yield to give favorable results on soils heavily infected with the root rot organisms.

Potato scab control studies in 1923, J. G. Gaines (pp. 414–421).—Additional data are reported on the value of applications of sulfur to soils for the reduction of potato scab. Fineness of sulfur seems to be a factor in its efficiency, and when mixed with raw rock phosphate to secure better distribution good control of scab was secured with Irish Cobbler, a very susceptible variety, as well as with Giant, a less susceptible one. With the latter variety applications at the rate of 600 lbs. of sulfur and an equal amount of phosphate gave better results than where 600 lbs. of the mixture were used.

Influence of environment in the protection of plants from disease [trans. title], R. A. Toro (*Porto Rico Dept. Agr. and Labor Sta. Circ. 90 (1925), Spanish ed., pp. 10*).—A brief discussion is given of means for the reduction of attacks of fungi, among them modification of moisture, temperature, and soil reaction, impeding the dissemination of fungi, and changing the relations between the development of the host plant and its parasites.

[**Disease and resistance in plants**] (*Brooklyn Bot. Gard. Rec., 13 (1924), No. 2, pp. 27–31*).—Studies by Graves have been noted as applying to chestnut bark disease (E. S. R., 48, p. 746) and to butternut disease (E. S. R., 53, p. 650). His work on birch Nectria canker, begun in 1918, recently located this disease on cherry birch (*Betula lenta*), on yellow birch (*B. lutea*), and on paper birch (*B. papyrifera*) in Maine. Disease-resistance studies were applied to *Ustilago levis* and *U. avenae*, as related to the influence of temperature and moisture on oat smuts. Infection in both *Avena sativa victor* and *A. nuda inermis* by *U. levis* occurred over a temperature range of from 5 to 30° C., the highest percentage occurring at 20 or 25°, according to variety and soil moisture. Soil reaction further influenced infection rate.

Progress is noted in studies on the inheritance of disease resistance and on the relation of soil moisture to infection.

Life history and taxonomic problems in Botryosphaeria and Physalospora, C. L. Shear (*Abs. in Brit. Assoc. Adv. Sci. Rpt., 92 (1924), pp. 451, 452*).—This study, of which certain morphological details are given, is said to indicate the need of a very thorough investigation of the morphology, physiology, and life history of such fungi in order to solve the many problems of taxonomy and pathology connected with them.

Parasitism in the genus Comandra, E. H. Moss (*Abs. in Brit. Assoc. Adv. Sci. Rpt., 92 (1924), p. 446*).—Of the four species of Comandra present in Canada at least three are semiparasites with a wide distribution and an extensive range of host plants. The haustoria by which the parasite is attached to the underground parts of its host are in general similar to those described for other santalaceous species. In the Rocky Mountains, *C. livida* is characterized by the occurrence in large numbers of variegated and more or less dwarfed individuals. Histologically the leaves of these abnormal plants exhibit features which are typical of mosaic diseases.

A note on the life history of Uromyces aloes (Cke.) P. Magn., S. L. Ajrekar and B. R. Tonapy (*Jour. Indian Bot. Soc., 3 (1923), No. 9–10, pp. 267–269, pl. 1, fig. 1*).—The life history of *U. aloes*, occurring at Talegaon (Dhamdhere), Poona District, on leaves of *Aloe vera*, has been worked out and found to include only two spore forms, teleutospore and spermatia. Infection with sporidia from the teleutospores produces a mycelium which first gives rise to spermogonia and then to teleutosori. In the germination of the teleutospores the promycelium is usually divided into two (rarely three) instead of the typical four cells, and the apical cell functions directly like a sporidium, putting out a threadlike germ tube.

A study of the environmental conditions influencing the development of stem rust in the absence of an alternate host, III, IV–VI, G. L. Peltier

(*Nebraska Sta. Research Buls. 34 (1925), pp. 3–12; 35 (1925), pp. 3–11*).—The first of these bulletins contains Part III, the second Parts IV–VI.

III. *Further studies of the viability of the urediniospores of Puccinia graminis tritici*.—Following methods previously described (E. S. R., 48, p. 45), the author secured additional data on Form IX of *P. graminis tritici* (E. S. R., 50, p. 446) and also on Form XXI. Urediniospores of Form IX retained viability for 18 weeks or longer when kept at temperatures of from 5 to 15° C. and at relative humidities varying from 29.5 to 70 per cent. Spores kept at 5° with humidity varying from 49 to 60.7 per cent gave more than 50 per cent germination at the end of 18 weeks.

With Form XXI the same relation was found between the viability of the urediniospores and the temperature and humidity in which they were stored. Spores of Form XXI held at 5°, with 49 per cent relative humidity, gave 30 per cent germination at the end of a year in storage and produced heavy rust infections on 2 out of 12 plants inoculated.

IV. *Overwintering of urediniospores of P. graminis tritici*.—As a result of five years' study the author concludes that the urediniospores of *P. graminis tritici* do not overwinter under conditions that prevail at Lincoln, Nebr.

V. *The period of initial infection of urediniospores of P. graminis tritici on wheat*.—Using Physiologic Form XXI of *P. graminis tritici*, a large number of wheat seedlings were inoculated, and under favorable conditions urediniospores were found able to form germ tubes and to enter stomata within 3 hours. The amount of infection increased with the period of incubation, but even within 24 hours' incubation less than 10 uredinia per leaf developed. With prolonged incubation a greater number of pustules were produced. It is concluded that under field conditions, the longer the optimum conditions for infection exist the more uredinia will be produced, although some infection can occur when these conditions prevail for only a few hours.

VI. *Influence of light on infection and subsequent development of urediniospores of P. graminis tritici on wheat*.—Inoculated plants were exposed to light of Mazda lamps of from 50 to 1,000 watts, and it was found that light was not a factor in the initial infection of wheat by urediniospores of stem rust, but that it is necessary for the development of the disease, being essential for the development of the host plant and as such contributing to the development of the pathogene, perhaps through a food relation.

Black stem rust situation in Michigan, W. F. REDDY (*Michigan Sta. Quart. Bul., 8 (1925), No. 3, pp. 148–151*).—The relation of the barberry to stem rust of wheat epidermics is discussed, and suggestions are given for the destruction of barberry bushes.

Single-bath hot-water and steam treatments of seed wheat for the control of loose smut, V. F. TAPKE (*U. S. Dept. Agr. Bul. 1383 (1926), pp. 29, figs. 4*).—The results are given of studies of hot-water and steam treatments of seed wheat for the control of loose smut, with a view of applying these methods to cooperative or community seed treatment plants. Some of the objections to the modified hot-water treatment are stated, and the single-bath method is described. This consists of the immersion of unsoaked seed in hot water. Various temperatures and lengths of treatment were tested, and the best results were obtained by soaking the seed for 1 hour and 50 minutes at 48° C., or 1 hour and 35 minutes at 49°. Loose smut was completely controlled and bunt practically eliminated by these treatments. Agitation of the hot water so as to reduce the time required for the heat to penetrate the sacks containing the wheat was found to be very desirable. Two types of machines are said to be available for the single-bath treatment, but under the present conditions their use is considered impracticable.

The steam treatment consisted of soaking the seed for 4 hours in cold water, after which it was placed in the grain drier and the temperature kept at from 46 to 48° for 1 to 5 hours. This treatment successfully controlled both loose smut and bunt without injury to germination or reduction of yield. The author states that the application of steam treatments to large quantities of wheat would involve some difficulties not encountered in his experiments.

The application of these treatments is said to involve the maintenance of constant temperatures for relatively long periods of time, special equipment, and other factors which make them hardly practicable of application by the individual farmer.

On the mode of infection and perennation of the smut of "doob" (Cynodon dactylon Pers.), K. C. MEHTA (*Jour. Indian Bot. Soc., 3 (1923), No. 9–10, pp. 243–251, pl. 1*).—Of the three smuts of doob (*C. dactylon*) recorded by Magnus (E. S. R., 11, p. 949), only *Ustilago cynodontis* is thought to do great damage to this important fodder grass on the plains of India. This disease is recorded for several areas in India and is thought to occur at other places. Besides destroying the whole inflorescence the smut also appears at the apexes of short aerial shoots and their terminal leaf blades. The host is infected only in very early germination stages. Blossom infection was not produced. A perennial mycelium perpetuates the disease, hibernating in the rhizome, which should not be used in cultivation.

The "black dot" disease of potato, B. T. DICKSON (*Abs. in Brit. Assoc. Adv. Sci. Rpt., 92 (1924), p. 452*).—This disease, which has been under investigation since 1921, is dealt with from historical, geographical, symptomatological, and economic viewpoints.

The organism isolated from Canadian material, with the saltation thereof, is described and compared morphologically and physiologically with *Vermicularia varians, Colletotrichum tabificum, C. atramentarium,* and *C. atrovirens* (?).

Hollow heart of potatoes, H. C. MOORE (*Michigan Sta. Quart. Bul., 8 (1926), No. 3, pp. 114–118*).—A report is given of studies of hollow heart of potatoes, which is believed to be a physiological state caused by conditions favoring excessively rapid development of the tuber. This trouble is said to have become important on account of the rejection of large shipments of potatoes where hollow heart was present.

Studies were made of rainfall, temperature, plant spacing, varietal susceptibility, soils, fertilizers, cultivation, etc., as factors contributing to hollow heart, and it was found that the trouble could be reduced by the adoption of methods of culture that are generally recommended for the production of good yields of high grade potatoes. Briefly, the recommendations for the prevention of hollow heart are the improvement of moisture conditions of the soil by preceding the potato crop with alfalfa, sweet clover, or some other legume in rotation, the application of stable manure several months previous to planting, planting the best seed available, using large seed pieces, planting early so that the potatoes will mature before the first frost, and shallow cultivation until the plants are in blossom. Frequent sprayings should be given to ward off insect and foliage disease attacks.

Potato leafroll in Ohio, P. E. TILFORD (*Ohio Sta. Bimo. Bul., 11 (1926), No. 2, pp. 55–59, figs. 2*).—After describing the symptoms of leaf roll and its transmission by aphids, the author reports reductions in yield of from 40 to 60 per cent in 1925 due to this disease.

Suggestions are given for the control of leaf roll through the planting of disease-free tubers, and it is pointed out that on account of climatic con-

ditions roguing in Ohio is more difficult than in some of the more northern potato-growing regions.

Pocket atlas of potato diseases.—I, Tuber diseases, O. Appel (*Taschenatlas der Kartoffelkrankheiten. I. Teil. Knollenkrankheiten. Berlin: Paul Parey, 1925, pp. [55], pls. 24*).—Opposite each of the 24 colored plates, each representing one potato tuber disease or condition, is a brief account of outstanding facts regarding that disease, such as forms, conditions, organisms, control measures, and economic bearings.

The sugar beet nematode (*La. Planter, 72 (1924), No. 10, p. 195*).—It is stated that the sugar beet nematode has been found, to date, only in a few well defined localities in the territory served by the Great Western Sugar Company. This organization is said to have inaugurated a campaign, chiefly of education, to hinder the spread of this pest, in ways which are indicated.

Biology and control of the beet nematode [trans. title], W. Baunacke (*Arb. Biol. Reichsanst. Land u. Forstw., 11 (1922), No. 3, pp. 185–288, pls. 4*).—Confining attention chiefly to the beet nematode (*Heterodera schachtii*) in Germany, the author gives an account dealing with its agricultural importance, distribution, studies of nematode-sick soils, previously used control means and methods, the reactions of free larvae to thermal and chemical stimuli, the thermal and chemical stimulability of embryos and larvae within the cysts, and more recent methods of control, the more hopeful of which are directed against the resting stages of the organism.

Resistance to disease and adverse conditions by hardy sugar cane types, H. P. Agee (*La. Planter, 72 (1924), No. 4, pp. 75, 76*).—In a further report by the committee in charge of the Hawaiian Sugar Planters' Experiment Station (E. S. R., 49, p. 35), attention is directed to the merits of certain cane varieties named, in part as related to yield conditions, including diseases (mosaic, root rot, and yellow stripe).

Apple disease studies in northern Virginia, F. J. Schneiderhan (*Virginia Sta. Bul. 245 (1926), pp. 3–35, figs. 4*).—The results are given of 4 years' work on the control of the more important apple diseases in northern Virginia.

For apple scab, a delayed dormant spray with concentrated lime sulfur, followed by summer strength lime sulfur for the pink, calyx, and 10-day spray, and a 3–4–50 Bordeaux mixture for 2 or 3 subsequent applications are recommended. The delayed dormant spray is considered of little importance for scab control, but the pink, calyx, and 10-day applications are valued at 90 per cent in the successful control of the disease. In years of severe scab infection some of the so-called resistant varieties of apples were found to be infected to the extent of 60 per cent.

For cedar rust, the author claims that the only practical method of control is the removal of cedar trees, about 2 miles being considered a safe distance.

For the control of apple blotch, Bordeaux mixture at intervals of 5 and 8 weeks, following an application of lime sulfur 10 days after petal fall, is said to have given excellent control. The two applications of Bordeaux mixture are considered the most important. Cankers should be cut out of the trees as far as possible.

Where bitter rot has prevailed during the previous season, the author recommends that all mummies should be removed early during the year and that all newly diseased fruits should be collected and 3 applications of Bordeaux mixture given, beginning with the 5-weeks period and repeating at 10-day intervals.

A discussion is given of liability to frost injury as a factor in locating apple orchards and the correlation between weather conditions, particularly rainfall, and the prevalence of fungus and insect injury.

Attention is called to the incompatibility between apple trees and black walnut trees when growing closely enough to permit of the intermingling of the roots.

Spray injury to apples is said to occur in Virginia, mostly following applications of lime sulfur at the 5-weeks spray and with Bordeaux mixture during cool weather. In hot weather there is liable to be more serious injury by lime sulfur than by Bordeaux mixture.

Apple scab, J. W. ROBERTS and L. PIERCE (*U. S. Dept. Agr., Farmers' Bul. 1478 (1926), pp. II+12, figs. 7*).—After a statement regarding the economic importance of apple scab, the life history of the organism is described, with special reference to control measures. For control the authors recommend spraying with lime-sulfur solution directly after the opening of the blossom clusters, with a second application immediately after the fall of the petals, followed by additional sprayings in from 2 to 4 weeks and from 8 to 10 weeks after petal fall, depending on the weather. Where blotch or bitter rot prevail and where injury occurs following the use of lime sulfur in hot weather, Bordeaux mixture should be employed, but the authors claim that under no conditions should Bordeaux mixture be used for the first and second applications. Dusts did not prove as efficient as dilute lime sulfur in the control of apple scab.

Spraying experiments with apples, A. J. FARLEY (*New Jersey Stas. Rpt. 1924, pp. 50, 51*).—Spraying experiments for the control of apple scab are said to indicate that dry-mix sulfur lime was as effective as concentrated lime sulfur as a summer fungicide, if its use was begun with the petal fall application. Concentrated lime sulfur 1–40 was more effective than dry-mix when used for the pink bud application, and it caused no burning of the foliage. However, it is said to be liable to cause injury to the fruit and foliage if used at the petal fall application or later.

Apple storage (*Indiana Sta. Rpt. 1925, p. 31, fig. 1*).—Experiments with oiled wrappers for the control of apple scald were continued. It is claimed that 0.5 lb. of shredded oiled paper per basket gave excellent results, and 0.75 lb. per basket results comparable with fruit wrapped in oiled paper. The development of scald on Grimes Golden was overcome by adding 0.75 lb. shredded oiled paper to each barrel. Apples removed from storage February 7 were held for several days without loss from scald.

Spraying experiments with peaches, A. J. FARLEY (*New Jersey Stas. Rpt. 1924, pp. 46–48*).—A report is given of the results of spraying experiments in which the merits of dry-mix sulfur lime containing various amounts of sulfur were compared with the standard dry-mix and atomic sulfur for the control of scab and brown rot of peaches. Lead arsenate was added to two of the early applications.

As no disease appeared the fungicidal value of the treatments could not be compared, but data on spray injury were secured. All mixtures containing a relatively low percentage of sulfur injured the leaves and new twig growth. The most severe injury occurred on trees sprayed with atomic sulfur and 2–4–50 dry-mix.

The cause of the injury was not definitely determined, but it is assumed that it was due directly or indirectly to the lead arsenate. Studies by N. Mogendorff are said to indicate that the injury caused by lead arsenate is wholly due to the liberation of soluble arsenic as a result of decomposition, and that sudden weather changes from cool and damp to warm are more likely to cause injury than protracted periods of the same kind of weather.

[Spraying experiments on peaches], H. J. BAKER (*New Jersey Stas. Rpt. 1924, pp. 180, 181*).—In tests for the control of brown rot and peach scab, the

results indicate that dry-mix sulfur lime was most effective, followed by self-boiled lime sulfur and atomic sulfur in the order enumerated.

Cryptogamic diseases of olive [trans. title]. E. Foex (In *Compte Rendu des Travaux du 6. Congrès International d'Oléiculture, Nice, 1923. Paris: Libr. Spécial Agricole, 1924, pp. 179–185, fig. 1*).—Olive knot, or bacterial tumor (*Bacterium savastanoi*), is briefly noted as to its history, distribution, characters, incidence, and control, which is preventive and consists in avoiding the use of infected material.

Two unreported parasites of Hevea brasiliensis, C. D. La Rue (*Mich. Acad. Sci., Arts, and Letters, Papers, 2 (1922), pp. 69–71*).—The author records as parasitic on *H. brasiliensis* two organisms said not to have been reported as injurious hitherto in this connection, namely, *Sclerotium* sp. and *Cephaleuros virescens*.

Pink disease of teak [trans. title], M. B. Schwarz (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Inst. Plantenziekten, No. 68 (1925), pp. 17, pls. 5*).—Teak pink disease is caused by *Corticium salmonicolor*. This disease has been reported from six places on Java and from Deli in Sumatra. The cortex is attacked at different ages, so that different stages of the disease can be distinguished. Secondary attacks by insects and fungi occur. The pink disease organism may enter through wounds, or through lenticels under very moist conditions. The three forms are described, with their relations.

Prevention of brown stain, A. J. Kehoe (*Timberman, 25 (1924), No. 7, p. 62*).—The author submits in brief detail, with recommendations, the results of treating timber to prevent brown stain in case of stock from fresh logs and from old logs. Temperatures range from 110 to 180° F., moisture being supplied (to prevent checking) toward the close of the process.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Bats in relation to the production of guano and the destruction of insects, E. W. Nelson (*U. S. Dept. Agr. Bul. 1395 (1926), pp. 12, figs. 4*).—In this discussion of the subject the author points out that nearly all the bats of North America north of the Tropics consume vast quantities of insects, almost entirely night-flying species, but apparently do not exterminate any.

The Mexican free-tailed bat (*Tadarida mexicana*), ranging in the United States in southern Texas, New Mexico, Arizona, and California, is extremely colonial in habits, occupying numerous caves and some buildings, and producing in places sufficient quantities of guano to be used commercially as fertilizer. Many difficulties are likely to be encountered in establishing colonies. Unless the bats can be attracted in large numbers, there is little hope of establishing a worth-while colony, because of the slow rate of reproduction, there being only one at a birth. In the single colony of bats successfully established there seems to be a profitable yield of guano. Other attempts have failed, and anyone contemplating the construction of bat roosts for commercial gain should be advised that the returns may be disappointing and wholly out of proportion to funds expended. Mosquitoes have been found abundant in and about bat caves, and in the single case known where colonial bats have been artificially established there has been no appreciable diminution in the insect life or in the local abundance of mosquitoes.

Report of the department of biology, T. C. Nelson (*New Jersey Stas. Rpt. 1924, pp. 237–246, pls. 2, fig. 1*).—This reports further observations of the abundance, distribution, and setting of oyster larvae, etc. In reporting upon work with marine borers (E. S. R., 52, p. 750), reference is made to the effects of the type of wood upon the shell characters and to parasites. A hetero-

trichous ciliate described by Nelson as *Boveria teredinidi* n. sp.[1] was found parasitic in great numbers upon the gills of Teredo and of Bankia. A recent bulletin on the oyster industry, by Dumont, has been noted (E. S. R., 54, p. 151).

Entomology [at the Arkansas Station] (*Arkansas Sta. Bul. 203 (1926), pp. 32–40, figs. 3*).—Notes are presented upon observations of several shade tree insects in Arkansas, including the bagworm, fall webworm, and the walnut caterpillar; upon several blister beetles which attack various farm and garden crops, quite satisfactory control of which has been secured by the use of sodium fluosilicate and calcium fluosilicate, as previously noted (E. S. R., 54, p. 157); upon poisonous arthropods, including the white flannel moth (*Lagoa crispata* Pack.), its life history and structure of the poisonous hairs (E. S. R., 53, p. 256), centipedes and scorpions of northwest Arkansas and southeastern New Mexico (E. S. R., 53, p. 157), and tarantulas, centipedes, and scorpions of the Canal Zone; birds; the striped cucumber beetle; and cotton insects, including the boll weevil and red spider.

Scolopendra heros, *S. polymorpha*, *Lithobius mordax*, *Theatops spinicaudus*, and the house centipede from northwest Arkansas and southeastern New Mexico were studied, and all found to be totally harmless so far as the effect of their poison is concerned. Scorpions, two species of which, *Centruroides vittatus* and *Vejovis spinigerus*, were studied, apparently vary widely in their poison properties, their sting being similar to but milder than that of the wasp. In the Canal Zone two tarantulas, *Sericopelma communis* and *Psalmopoeus pulcher*; two species of scorpions, *C. margaritatus* and *Opisthacanthus lepturus*; and one species of centipede were studied.

The tarantula *S. communis*, believed to be one of the so-called banana spiders brought to the United States in shipments of bananas, was permitted to bite rats and guinea pigs. In 30 minutes the bitten area of a rat was visibly swollen and dark red and purplish, in 1 hour and 15 minutes the rat showed signs of recovery, and in 3 hours and 40 minutes it had practically recovered. A second test with another tarantula and another rat showed practically the same results. Two guinea pigs bitten by this species of tarantula died in about half an hour. The test was then made on man, taking precautions that he would get a relatively small dose of the poison. Rather severe pain appeared at once, and later the pain was so great that ammonia was applied. The finger became swollen and stiff. In an hour the sharp pain had largely subsided, there was a strong tingling sensation, and the stiffness and lame feeling extended to the third finger. The swelling gradually spread over most of the hand. Two hours after the bite took place hot water was used as a remedy for the pain. After keeping the hand in comfortably hot water for 30 minutes the pain was practically gone, most of the swelling had disappeared, and the stiffness was somewhat lessened. A peculiar sensitiveness and stinging sensation, felt when gently rubbing the skin, remained for some time. All other pain disappeared within 6 hours after the bite. A lameness in the joints of the small finger persisted for nearly a week. Thus *S. communis* must be regarded as poisonous.

The fluosilicates of sodium and calcium were the only insecticides found effective in killing large numbers of the cucumber beetle. The calcium fluosilicate was used in a compound containing only 15 per cent of the insecticide. Sodium fluosilicate caused injury to plants when used alone, but when diluted with hydrated lime was effective and usually caused no injury.

Entomology [at the Indiana Station] (*Indiana Sta. Rpt. 1925, pp. 23–24, figs. 2*).—This is a brief account of progress made during the year. In report-

[1] Anat. Rec., 26 (1923), No. 5, p. 356.

ing on work with flies attacking dairy cattle, it is stated that in a series of tests the Purdue formula of oil of tar, fish oil, and crude carbolic acid and a new mixture of chlorozone, oil of tar, and kerosene gave the best results. At the time of writing, on June 30, 1925, tests with such new materials as used crankcase oil and oil of tar and kerosene emulsion were also very promising.

Report of the department of entomology [of the New Jersey Stations], T. J. Headlee et al. (*New Jersey Stas. Rpt. 1924, pp. 279–349, fig. 1*).—Following a brief discussion of the prevalence of economic insects in the State during the year, climate and insect investigations, and codling moth investigations, an account of the Oriental Peach Moth in the Season of 1923 (pp. 291–294) (E. S. R., 53, pp. 360, 653), Further Observations on the Pepper Maggot (*Spilographa electa* Say) during 1923 (pp. 295–298) (E. S. R., 52, p. 752), and Some Chemicals Attractive to Adults of the Onion Maggot (*Hylemyia antiqua* Meig.) and the Seed Corn Maggot (*Hylemyia cilicrura* Rond.) (pp. 298, 299), all by A. Peterson, are presented. These are followed by the Report of the Cranberry Substation, by C. S. Beckwith (pp. 300–305), part of which is noted on p. 39; soil-infesting insect investigations (pp. 305–325); and Bee Investigations, by R. Hutson (pp. 325–349).

A table is presented which records data on the effect of the size of the particle on the effectiveness of certain dust materials. In reporting upon codling moth investigations, an analysis is made of the factors which are considered to underlie the efficient employment of the first-brood side-worm and the second-brood side-worm sprays for codling moth, namely, the amount of arsenic per tree and the continuity with which the arsenical coating is maintained.

The relation which exists between lead hydrogen arsenate and lime when the mixture is applied to foliage, as studied by F. L. Campbell, is also briefly reported upon. It is concluded that (1) acid lead arsenate reacts slowly with calcium hydroxide to form trilead arsenate and tricalcium arsenate and water. (2) Arsenical injury to foliage by acid lead arsenate sprays and by acid lead arsenate and lime sprays seems to be made possible by the action of a leaf-water film on the dried spray deposit. The leaf-water film appears when temperature and relative humidity are high enough. (3) Arsenic in the leaf-water film in the form of calcium arsenate is less injurious to foliage than it is in the form of arsenic acid—hence, a combination spray of lime and acid lead arsenate, which throws a trace of calcium arsenate into solution, would be expected to be safer for use than an acid lead arsenate spray alone, which throws a trace of arsenic acid into solution; (4) but concentration of the arsenic acid ion may become high enough in the leaf-water film in the combination spray deposit to cause serious injury if the excess calcium hydroxide is completely converted to calcium carbonate and humid weather conditions prevail.

In the soil-infesting insect work, experiments with carbon disulfide and with calcium cyanide on market garden soil are reported, the details being presented in tabular form. The toxicity of the carbon disulfide, in the emulsion form, for plant growth was so markedly less than that of the calcium cyanide that it seemed wisest in practice to recommend the use of the former. The emulsion is made by combining 1 part resin fish oil soap by volume, 3 parts of water, and 10 parts of technical carbon disulfide. In view of the checking effect of this carbon disulfide emulsion treatment, as shown on lettuce, beets, and cabbage, the author believes that the application should be made before the plants are put into the ground.

In reporting upon bee investigations, Hutson discusses the progress of apple pollination and of cranberry pollination. In work on disappearing disease, two authentic cases were investigated, in both of which arsenic was found in

sufficient amounts (over 0.0002 mg. per bee) to cause death. Reference is also made to the work of breeding European foulbrood resistant and high-producing bees.

The complexity factor in insecticidal measures, E. W. Stafford (*Jour. Econ. Ent., 19 (1926), No. 1, pp. 60–62*).—The author points out that an insecticidal measure to be popular must be simple, i. e., it must involve few ingredients and require few instructions.

Investigations on oil sprays, A. L. Melander, A. Spuler, and E. L. Green (*Washington Col. Sta. Bul. 197 (1926), pp. 5–19, figs. 2*).—This contribution is in continuation of investigations on mineral oil emulsions for dormant sprays previously noted (E. S. R., 52, p. 656). It was found that the best oils for dormant spraying are those medium lubricating oils which distill about one-half their volume between 240 to 300° C. at 40 mm. absolute pressure. Medium Red Engine is the trade name of a characteristic oil of this type. Specific gravity, viscosity, and the source, whether asphalt or paraffin base, have only an incidental effect on the insecticidal value of an oil.

It is concluded that cresoap is the best emulsifier. W. S. C. miscible oil is more effective than caseinate oil or other mechanical emulsions. Caseinate spreader should not be used with a miscible oil, but may be added to a caseinate-oil spray. Spraying twice at half strength, either with or without caseinate spreader, is not practical. Oil sprays for leaf-roller eggs should be used at from 7 to 8 per cent actual oil content and for San Jose scale at not less than 4 per cent. Proprietary oil sprays should be diluted on the basis of actual oil content, irrespective of claims for exceptional superiority for certain brands.

The present status of oil spraying in the Northwest, W. S. Regan (*Jour. Econ. Ent., 19 (1926), No. 1, pp. 86–94*).—Investigations in the Northwest have shown that the kind of emulsifier and method of emulsification of spray oil are practically as important as the oil itself from the standpoint of safety and efficiency. A highly refined, colorless oil emulsion has proved a safe and effective ovicide for the codling moth, and has been used successfully as a summer control for the San Jose Scale. The use of any dormant type of oil spray, even at low percentages, during the growing season is a dangerous practice.

Studies of some adsorbed insecticides, C. O. Eddy (*Jour. Econ. Ent., 19 (1926), No. 1, pp. 77–86*).—Preliminary tests at the South Carolina Experiment Station by the author showed that chewing insects like the Colorado potato beetle and the Mexican bean beetle can be killed and controlled by adsorbed insecticides. Soluble arsenicals, sodium arsenate, sodium arsenite, potassium arsenate, and potassium arsenite carried by dusts of kaolin, diatomaceous earth, fuller's earth, talc, and tripoli were used. Since small amounts of toxins are used with very cheap carriers, the product should be less expensive than other arsenical poisons.

Cyanides of calcium, V. I. Safro (*Jour. Econ. Ent., 19 (1926), No. 1, pp. 62–65*).—It is pointed out that with the development of several commercial products containing cyanides of calcium differing in composition, greater accuracy in interpreting experimental results is now possible.

House fumigation with calcium cyanide, R. C. Smith (*Jour. Econ. Ent., 19 (1926), No. 1, pp. 65–77*).—In this contribution from the Kansas Experiment Station, the author reports upon the results of 18 fumigations with calcium cyanide for household insects, covering a period of two years. After 6 more or less preliminary tests with different forms of cyanide, various dosages, and methods of application, it was decided that 2 lbs. of calcium cyanide granules, or "G grade," to 1,000 cu. ft. of space, applied by spreading thinly

on dry papers in tightly closed rooms and left for 24 hours, should give satisfactory results.

The use of dusts for the control of apple pests and diseases under Missouri conditions, K. C. SULLIVAN (*Jour. Econ. Ent., 19, 1926*), *No. 1, pp. 56–59*).—The author reports that during the season of 1925 the dust sprays were tested for the first time for the control of apple pests and diseases with very good success. Both sulfur dust and copper-lime dust compared favorably with the liquid sprays, while in some cases they gave better control of both the insect pests and plant diseases than did the liquids.

Insect pests of truck and garden crops, D. C. MOTE (*Oregon Sta. Circ. 65* (*1926*), *pp. 5–40, figs. 27*).—This is a practical summary of information.

The creosote-calcium cyanide chinch bug barrier, E. G. KELLY (*Jour. Econ. Ent., 19* (*1926*), *No. 1, pp. 121–123, pls. 2*).—The author reports that the creosote-calcium cyanide barrier, which is an improvement on earlier barriers, was successfully demonstrated in 30 Kansas counties as an effective check on the chinch bug. Directions are given for the construction and maintenance of the barriers.

On the distribution and host plants of the cotton flea-hopper (Psallus seriatus Reuter), Hemiptera, Miridae, H. H. KNIGHT (*Jour. Econ. Ent., 19* (*1926*), *No. 1, pp. 106–108*).—The author finds that the natural hosts of the cotton flea-hopper are various species of Croton, especially *C. texensis*. The distribution of the insect and a description are given.

The tarnished plant bug as a peach fruit pest, B. A. PORTER (*Jour. Econ. Ent., 19* (*1926*), *No. 1, pp. 43–48, pl. 1*).—The author describes an injury by the tarnished plant bug to peach blossoms and very small peaches during the few weeks following blooming time in southern Indiana. This injury, which repeated caging tests have demonstrated is caused by the tarnished plant bug, is of a type very unusual for a sucking insect. It is thought very likely that this is the injury which later in the season develops into a scarred and distorted condition and which has locally been given the name "cat-faced" peaches. This "cat-facing" causes serious losses in southern Indiana, southern Illinois, and western Kentucky.

The life histories of two leafhoppers: A study in adaptation, E. D. BALL (*Jour. Econ. Ent., 19* (*1926*), *No. 1, pp. 95–99, fig. 1*).—This is a contribution to the life histories of two leafhoppers, *Alebra albostriella* and *Erythroneura maculata*, illustrating the adaptability of the species.

Notes on the economic status of certain Cuban Homoptera, H. OSBORN (*Jour. Econ. Ent., 19* (*1926*), *No. 1, pp. 99–106*).—This consists of biological and economic notes on a number of Cuban Homoptera.

Control measures for the Houghton gooseberry aphis, with special reference to plant resistance, D. M. DELONG and M. P. JONES (*Jour. Econ. Ent., 19* (*1926*), *No. 1, pp. 40–43, pl. 1*).—The authors report that a three-year study of *Myzus houghtonensis* (Troup), officially known as the gooseberry witch-broom aphid, has shown that, while engine oil emulsion, miscible oil, nicotine, or a combination of either oil with nicotine will kill the hatching aphids and prevent formation of galls, it is almost impossible to obtain a practical control since the aphids migrate from plant to plant in the third seasonal generation and multiply rapidly after the migration. They conclude that a strain of plant apparently resistant to their attacks gives greatest promise as a means of control.

The care of samples used in scoring the results of dormant sprays for the San Jose scale, J. S. HOUSER (*Jour. Econ. Ent., 19* (*1926*), *No. 1, pp. 94, 95*).—The author points out that moisture, natural or artificial, apparently

plumps dead San Jose scale, and thus may vitiate records by misleading investigators as to the percentage of live scale.

The hemlock measuring-worm (Ellopia fiscelleria), C. B. DIBBLE (*Michigan Sta. Quart. Bul., 8 (1926), No. 3, pp. 145–148, figs. 2*).—This is an account of a geometrid moth, the larva of which defoliated hemlock, balsam, and, to a lesser degree, other forest trees during the summers of 1924 and 1925 in northern Michigan. One complete defoliation kills hemlock, and if at all severe the defoliation is sure death to all the conifers and to many hardwoods when it occurs on two or more successive years. In spraying work at Leland, Mich., in 1925 a fair measure of success was obtained despite the fact that the application was made late in the season. It is recommended that arsenicals be applied with high-power machines in order that the tops of the trees may be reached as soon as the worms appear, using 2 lbs. of dry powdered arsenate of lead to 100 gal. of water in spraying and 10 lbs. of arsenate of lead to 100 lbs. of hydrated lime in dusting.

The status of the European corn borer in Ontario, 1925, H. G. CRAWFORD and L. S. MCLAINE (*Jour. Econ. Ent., 19 (1926), No. 1, pp. 124–127*).—During the season of 1925 the European corn borer extended its range in Ontario outside the quarantine area of 227 townships by 25 townships. The increase in the Counties of Essex and Kent was most marked, the crop throughout at least 400 square miles being completely ruined.

Codling moth investigations, L. HASEMAN (*Jour. Econ. Ent., 19 (1926), No. 1, pp. 53–55*).—This is a report of work conducted in Missouri since 1922, which shows that a fine mist spray under 100 lbs. pressure places the most arsenic in the calyx cup of apple blossoms, though not a great deal more than coarser sprays with higher pressures. The average amount placed in the calyx cup in thorough orchard spraying work is sufficient to prove a lethal dosage for the small apple worms which attempt to enter at the calyx end of the fruit.

Control of the fruit tree leaf roller with lubricating oil emulsion, W. P. FLINT and J. H. BIGGER (*Jour. Econ. Ent., 19 (1926), No. 1, pp. 49–52*).—It is pointed out that from 1922 to 1924 the fruit tree leaf roller increased in abundance in western Illinois orchards, and for the first time became a serious pest of apples in that section, having destroyed up to 50 per cent of the entire crop in some of the largest orchards in 1924. Experimental work during the winter of 1924–25 has shown a very high kill of eggs by the use of 8 per cent boiled lubricating oil emulsion and by some of the commercial oils. A nearly complete clean-up of leaf roller was obtained in some of the largest orchards by spraying with 8 per cent oil emulsion.

The chronological distribution of the bee moth, F. B. PADDOCK (*Jour. Econ. Ent., 19 (1926), No. 1, pp. 136–141*).—The spread of *Galleria mellonella* over the globe is traced chronologically by countries.

Report of mosquito work, T. J. HEADLEE ET AL. (*New Jersey Stas. Rpt. 1924, pp. 350–371, figs. 6*).—A report on studies of mosquito repellents, by W. Rudolfs (pp. 350–353), is followed by an account of the practical work, by W. M. Walden (pp. 353–371), under the headings salt marsh drainage; plans, surveys, and inspections; county work; municipal work; prevalence of mosquitoes during the year; correlation of mosquito commission work; educational work; and work with other agencies.

Relation of summer rainfall to mosquito prevalence, T. J. HEADLEE (*New Jersey Stas. Bul. 423 (1925), pp. 3–14, figs. 7*).—This paper, presented at the annual meeting of the New Jersey Mosquito Extermination Association in February, 1925, deals with the influence of temperature upon mosquito breeding, the influence of acidity, alkalinity, sunlight, and food supply, the influence of tides, and the influence of rainfall.

Control of cherry fruit-fly, R. H. PETTIT (*Michigan Sta. Circ. 86 (1926), pp. 3–9*).—This is a discussion of control measures for *Rhagoletis cingulata* and *R. fausta*. The author considers the most promising method of control that has been developed up to the present time, and the one most effective in 1925, to consist in the application of arsenical sprays or dusts. Lime sulphur, 1–40 for sour cherries and 1–50 for sweet cherries, should be applied before blossoms appear, and the same with the addition of 2.5 lbs. of arsenate of lead to each 100 gal. should be applied (1) after the petals fall, (2) after the shucks fall, and (3) when the cherries begin to show a faint color.

Tests of the dependability of the practice of separating infested cherries by cold storage in water and skimming immediately gave promising results, but indicated that any prolonged delay in skimming or floating off the defective fruits is sure to result in the waterlogging and consequent sinking of many fruits infested by larvae of either the plum curculio or the cherry fruit fly.

The apple maggot, R. H. PETTIT (*Michigan Sta. Circ. 87 (1926), pp. 7, figs. 7*).—A practical account of this pest and means for its control.

Braula coeca in Maryland, V. N. ARGO (*Jour. Econ. Ent., 19 (1926), No. 1, pp. 170–174*).—This is a report of observations made in parts of Maryland during the summer of 1925. The feeding and breeding habits are discussed and the economic importance of the insect pointed out.

A preliminary report on the control of wireworms on truck crops, J. L. HORSFALL and C. A. THOMAS (*Jour. Econ. Ent., 19 (1926), No. 1, pp. 181–185*).—In this contribution from the Pennsylvania Experiment Station the authors report that preliminary experiments indicate the possibility of successfully controlling wireworms with calcium cyanide used as a soil fumigant. The use of a trap bait in the spring followed by an application of granular calcium cyanide before the crops were planted gave the most promising results. Summer treatments killed many wireworms, but caused injury to cabbage and celery. Fall treatments were only partly successful due to the depth of the insects in the soil at this time, their decreased activity, and other factors.

Preventing damage by Lyctus powder-post beetles, T. E. SNYDER (*U. S. Dept. Agr., Farmers' Bul. 1477 (1926), pp. II+13, figs. 10*).—This bulletin supersedes Farmers' Bulletin 778, previously noted (E. S. R., 36, p. 758).

Poisoned baits for strawberry root weevil, A. L. MELANDER and A. SPULER (*Washington Col. Sta. Bul. 199 (1926), pp. 22, figs. 8*).—The authors find that the destructive root weevils of strawberry, *Brachyrhinus sulcatus*, *B. ovatus*, and the less common *B. rugifrons*, can be satisfactorily, economically, and practically controlled by the distribution of a poison bait known as Weevilure immediately at the close of the berry harvest. This bait is prepared by sun or oven drying sliced apples and then grinding them into pulp or granules and stirring with dry powdered poison. For the 5 per cent poison constituent magnesium arsenate, zinc arsenite, calcium arsenate, and sodium fluoride are recommended, giving preference in the order named. This bait should be broadcasted over the strawberry plants at the rate of about 70 lbs. per acre.

Early summer dispersion of boll weevil, D. ISELY (*Arkansas Sta. Bul. 204 (1926), pp. 17, figs. 4*).—This is a report of investigations made with a view to aiding growers in locating early infestations and in determining when dust applications can be made with greatest advantage. Small areas in cotton fields infested by overwintering weevils are usually difficult to locate until squares begin to flare and fall, or until the greatest activity of this brood of weevils is past. It was found, however, that these infested spots are the

centers of spread, and that if they are marked later infestations can be easily traced to them. The beginning of the second and third periods of activity and spread of weevils in early summer coincides with the beginning of the corresponding generations of weevils. Newly transformed weevils were found to be relatively nonmigratory until they become sexually mature.

Early summer dispersion of the boll weevil, D. Isely (*Jour. Econ. Ent., 19 (1926), No. 1, pp. 108–112*).—In this contribution from the Arkansas Experiment Station the author points out that the dispersion of the cotton boll weevil within a field after the hibernating weevils have become established is periodic. The spread of weevils across a field is usually direct from plant to plant or row to row, and is not the result of long flights.

Progress in cotton boll weevil control, W. E. Hinds (*Jour. Econ. Ent., 19 (1926), No. 1, pp. 112–121, pl. 1*).—In this contribution from the Louisiana Experiment Stations the author discusses the progress of boll weevil control, pointing out that dusting by airplane will become an important method of control in the near future.

Field notes on honey from long-tubed flowers, A. C. Burrill (*Jour. Econ. Ent., 19 (1926), No. 1, pp. 163–170*).—This is a collection of notes on the subject accompanied by references to the literature.

Results from the use of a water-soap-formalin solution for sterilizing American foul-brood combs, G. H. Vansell (*Jour. Econ. Ent., 19 (1926), No. 1, pp. 158–161*).—The author finds that combs infected with *Bacillus larvae* White can be economically sterilized by replacing the solution of alcohol and formalin with a much cheaper solution of water, soap, and formalin. The sterilization is easily accomplished by the removal of the honey and immersing the combs in the formalin solution for 48 hours, after which they are aired and ready for further use in the colonies.

The California buckeye and its relation to the hive bee, G. H. Vansell (*Jour. Econ. Ent., 19 (1926), No. 1, pp. 133–136*).—The author calls attention to the fact that a small grass-feeding bug, *Irbisia solani* Heid., migrates from drying grass to feed on California buckeye, and that the exudate from their punctures is collected by bees and may be a factor in buckeye poisoning of the bees. A detailed account of experiments by the author has been noted (E. S. R., 54, p. 663).

The utilization of pollen and pollen substitutes by the honeybee, R. L. Parker (*Jour. Econ. Ent., 19 (1926), No. 1, pp. 161–163*).—This is an abstract of a contribution from the Kansas Experiment Station.

Experiments in attracting queen bumblebees to artificial domiciles, T. H. Frison (*Jour. Econ. Ent., 19 (1926), No. 1, pp. 149–155, figs. 2*).—The author finds that the securing of the nests of bumblebees for study and experimentation by attracting and inducing the queens to nest in artificial domiciles is a great improvement over the chance locating of their nests.

ANIMAL PRODUCTION

Animal husbandry, H. J. Waters and F. G. King (*Boston and London: Ginn & Co., 1925, pp. VIII+546, pls. 2, figs. 322*).—This is an elementary textbook on the breeds, judging, feeding, care, management, and breeding of horses, beef and dairy cattle, swine, sheep, and poultry.

Productive feeding of farm animals, F. W. Woll and G. H. True (*Philadelphia and London: J. B. Lippincott Co., 1925, 4. ed., rev., pp. XIV+385, pls. 3, figs. [103]*).—This is a revised edition of the book previously noted, by Woll (E. S. R., 37, p. 94).

The mineral nutrition of farm animals, L. A. MAYNARD (*N. Y. Agr. Col. (Cornell) Ext. Bul. 130 (1925), pp. 24, figs. 7*).—A discussion of the minerals more commonly deficient in livestock rations with reference to their sources and assimilation.

The methods of calculating the nutritive value of livestock feeds [trans. title], R. GOUIN (*Bul. Soc. Sci. Hyg. Aliment., 13 (1925), No. 6, pp. 323–337*).—A comparison of the methods of calculating the nutritive value of feeds.

The nutritive value of the various layers of the wheat and corn kernel, A. KLEIN, C. FUNK, B. HARROW, and L. PINE (*Soc. Expt. Biol. and Med. Proc., 23 (1925), No. 1, pp. 20, 21*).—This is a brief report of chemical and biological analyses of the proteins of the various milling fractions of wheat and corn.

The chemical analyses of the wheat products (bran, middlings, red dog, first clear, second clear, and patent flour) showed that the gliadin increased with the different products from bran to patent flour. The globulin content was much higher in the bran, middlings, and red dog than in the three grades of flour. The glutenin content diminished with the more refined products from the outer layers to those used primarily in making the patent flour. The corn products gave similar results. The study leads to the conclusion that the peripheral layers of the cereal grains contain more of the dietetically balanced protein than does the flour.

Studies of the biological values of the proteins, conducted according to the method of Mitchell (E. S. R., 51, p. 407), with rats, showed that the fractions containing the pericarp and the germ have higher nutritive values than those composed mainly of endosperm. The differences may be due to the quality and quantity of the protein, the vitamin content, or a combination of these factors.

Composition of Arizona forages, with comparative data, C. N. CATLIN (*Arizona Sta. Bul. 113 (1925), pp. 155–173*).—The chemical analyses of various Arizona forages, hays, silages, fodders, grains, and miscellaneous feeding stuffs are tabulated, as well as the digestibility of some of these materials as reported by other experiment stations. Comparisons are made of the nutrients of some of the range forages with alfalfa hay.

Pineapple bran, L. A. HENKE (*Hawaii Univ., Ann. Short Course Pineapple Prod., 3 (1924), pp. 86–93*).—The composition and characteristics of pineapple bran are given, with discussions of its feeding value for the various classes of animals, including the results of feeding experiments with dairy cows and swine noted from other sources (E. S. R., 52, p. 376; 54, p. 270).

Feeding stuffs report, 1924, J. W. KELLOGG (*Penn. Dept. Agr. Bul. 403 (1925), pp. 237*).—The report of the chemical and microscopic analyses of feeding stuffs for the year 1924 (E. S. R., 52, p. 866).

Commercial feeding stuffs, September 1, 1924, to August 31, 1925, B. YOUNGBLOOD, F. D. FULLER, and S. D. PEARCE (*Texas Sta. Bul. 336 (1925), pp. 7–142*).—The usual report of the feeding stuffs analyzed in the State (E. S. R., 53, p. 667).

Time relations of growth.—I, Genetic growth constants of animals, S. BRODY (*Jour. Gen. Physiol., 8 (1926), No. 3, pp. 233–251, figs. 4*).—The physicochemical conception of growth is discussed in this paper, which is the first of a series from the Missouri Experiment Station, attempting to evaluate growth constants by the methods of physical chemistry.

It is shown that the smoothed time curve of growth in weight is sigmoid, with the point of inflection occurring when slightly over one-third of the mature weight is reached in all the animals except man. The following equation was found to express the growth in weight after the inflection period:

$$W=A-Be^{-kt}$$

in which W is the body weight at any age t, A is the mature weight, B represents the quotient of the theoretical velocity of growth when t is 0 divided by the fractional decline in growth rate k, and e is the natural base of logarithms. The values of A, B, and k have been calculated for 74 different types and sexes of animals and man, based on data from various sources.

Time relations of growth.—II, The equivalence of age in mammals estimated on the basis of their growth constants, S. Brody, C. D. Sparrow, and H. H. Kibler (*Jour. Gen. Physiol., 9 (1926), No. 3, pp. 285–308, figs. 15*).—In continuing the study noted above, the authors have calculated the corresponding equivalent age values, for Jersey, Ayrshire, and Holstein cows, Duroc-Jersey sows, Suffolk and Shropshire-Merino ewes, male guinea pigs, male and female albino rats, male Norway rats, and male and female albino mice, of A and k as given in the above formula and have thus compared the growth curve of these different animals when constructed on an equivalent age basis. Two tables give the age equivalent values for the different animals, and 15 charts show the comparative weight equivalents and growth curves of the various animals.

Fertility and sterility in domestic animals, J. Hammond (*Jour. Farmers' Club [London], 1925, pt. 6, pp. 105–122*).—A popular discussion of the factors related to fertility and sterility in domestic animals.

The distribution of domestic animals, E. Huntington (*Econ. Geogr., 1 (1925), No. 2, pp. 143–172, figs. 32*).—This discusses the world's distribution of domestic animals, referring especially to the relation of climate and environment.

The taurine world, A. H. Sanders (*Natl. Geogr. Mag., 48 (1925), No. 6, pp. 591–710, pls. 20, figs. 76*).—This is a popular and completely illustrated account of the different types of cattle and cattle production found in the various parts of the world, including descriptions of the modern breeds native to the different countries.

A study of the breeding records of a group of Shorthorn cows, C. V. Wilson (*West Virginia Sta. Bul. 198 (1925), pp. 55, figs. 9*).—The results are reported of a study of the breeding records of the first 10,000 cows which were born in 1908, as registered by the American Shorthorn Breeders' Association.

This study showed that among the 10,000, 4,440 or 44.4 per cent. were without registered produce during their first 12 breeding years. The 5,560 cows producing calves were divided according to those having from 1 to 11 offspring. This arrangement of the data showed that approximately one-half of the cows had less than 4 calves, but further study of the records showed that the cows calving 4, 5, 6, and 7 times were the ones upon which the breed was chiefly dependent for the maintenance of its population.

The sex ratios of the calves varied slightly, the average being about 1.33 heifers to 1 bull for those recorded in the different volumes of the herdbook, but it is pointed out that the prices had a measurable effect on the numbers of males and females registered, as during times of low prices smaller numbers of bulls are registered than heifers. Cows that had not calved since 1919 amounted to 90.3 per cent, indicating that Shorthorns are generally not retained in the herd after reaching 12 years of age. Studies of the families appearing in the pedigrees of 86 cows which calved 9 or 10 times indicated that certain families among the earliest importations were prolific and widely dispersed. This study revealed the fact that the so-called English and Scotch-topped cattle are more numerous than Pure Scotch.

Of the first 5,000 cows selected 49 were reported as one of a pair of twins. Among these, 32 were pairs of twin sisters, and 17 were registered as one twin without the sex of the other being reported. Only 3 of the latter produced registered calves, and 14 individuals of the 16 pairs of twins did not produce. There was no case recorded of a twin cow producing twin calves.

In a further study of the data, the produce were graded according to the calendar months, and it was found that the largest percentage of calves were produced in March, April, and May, with the least produced in November and December. It is further pointed out that these results are in conformity with data obtained from the Bureau of Crop Estimates, U. S. D. A., for cattle in 1913.

In studying the breeding practices with reference to the age of mating heifers, the records of 2,500 heifers that had calved at least twice and whose first registered calves were dropped between the ages of 15 to 48 months indicated that there was much variation in the age of first breeding, but that in general heifers were bred at from 15 to 30 months of age, as 67.56 per cent of those studied dropped their first registered calves between 24 and 39 months of age. Some preference for calving at 31 to 36 months of age was indicated, but it is suggested that this was due to the heifers having previously dropped an unregistered calf or having been bred without producing offspring. Heifers calving before 24 months of age produced an average of 7.17 registered calves as compared with 6.54 calves produced by heifers first calving at 38 to 49 months of age, and it was also found that of those producing 2 registered calves the ones first calving before 38 months of age were more certain to produce at least 5 or more registered calves than those producing their first calves after 38 months of age.

The variations in the quantity of food required by cattle for maintenance and fat production with different kinds of rations, J. Wilson (*Roy. Dublin Soc. Sci. Proc., n. ser., 18 (1925), No. 7, pp. 77–91, figs. 2*).—The calculation of maintenance and energy requirements of cattle is discussed, and it is pointed out that the type and size of the ration materially affect the amount of energy required for maintenance. Data from Kellner's experiments are presented, and it is shown that when animals are fattening and receiving large amounts of coarse roughage the maintenance allowance would be greater than when they are held at maintenance or are receiving a relatively larger amount of concentrated feed in the ration.

The variations in the quantity of food required by cattle for maintenance and production with different kinds of rations, J. Wilson (*Roy. Dublin Soc. Sci. Proc., n. ser., 18 (1926), No. 10, pp. 117–125, figs. 3*).—In continuing this series (see above), a critical study has been made of the methods used by Armsby in determining the net energy requirements of cattle. The wide variations in the requirements calculated in different trials are attributed to the fact that no account has been taken of the increased energy required for the digestion of roughages as compared with concentrates.

Results of four years' work in fattening steers [trans. title], F. Schwencke (*Tidsskr. Norske Landbr., 32 (1925), No. 5, pp. 152–160*).—The results of four fattening experiments with steers on various rations are tabulated.

Soybean hay versus alfalfa hay for fattening steers (*Arkansas Sta. Bul. 203 (1926), pp. 24, 25, figs. 2*).—The rate and economy of gains made by one lot of 11 yearling and 2-year-old steers receiving ear corn, cottonseed meal, and soy-bean hay in a 112-day test were compared with the rate and economy of

gains made by another lot receiving the same feeds except that alfalfa hay replaced the soy-bean hay. The steers fed alfalfa hay made an average daily gain of 2.50 lbs. per head, while those fed soy-bean hay made an average daily gain of 2.41 lbs. per head. A little less feed was required per unit of gain by the lot receiving alfalfa hay.

Sheep feeding trials, A. H. E. McDonald, M. Henry, and F. B. Hinton (*Agr. Gaz. N. S. Wales, 36 (1925), No. 7, pp. 473-476*).—The results of a test of various methods of handling ewes with lambs are reported. A group of 150 ewes with lambs averaging 7 weeks of age was allowed to run on fodder crops during the day, and at night it was divided into 3 lots, one lot being given roughage and corn, another roughage and oats, while the third lot was not hand-fed. During the 3 months of the test period the green feed was plentiful.

The results showed that the oat-fed lot was in slightly better bloom at the end of the trial, but there was very little difference in the gains of the lambs, the averages being for those receiving corn 30.9 lbs., oats 31.3 lbs., and for those getting no hand feeding 29.8 lbs. The financial aspects of the 3 methods are discussed, and it is concluded that the extra feeding was profitable. In a dry season the results would have been more pronounced.

Sheep production in Australia, P. Wenz (*L'Élevage du Mouton en Australie. Paris: Émile Larose, 1925, pp. VII+51, pls. 2, figs. 18*).—The methods of care and management of sheep in Australia are described, with special reference to their application to conditions in the French colonies.

Corn supplements and substitutes for fattening lambs, H. D. Fox (*Nebraska Sta. Bul. 211 (1926), pp. 22*).—In continuing the feeding experiments in fattening lambs (E. S. R., 52, p. 568), the comparative value of a basal ration of shelled corn and alfalfa hay with and without various supplements and changes in the basal ration was studied in two experiments.

In the first experiment 7 lots of 30 lambs, averaging 59 lbs. at the start, were fed 100 days on the following rations: Lot 1, shelled corn and alfalfa hay; lot 2, shelled corn, linseed meal, and alfalfa hay; lot 3, shelled corn, corn silage, and alfalfa hay; lot 4, shelled corn, linseed meal, corn silage, and alfalfa hay; lot 5, shelled corn, tankage, and alfalfa hay; lot 6, barley and alfalfa hay; and lot 7, barley during the first half of the experiment and shelled corn during the second half, with alfalfa hay throughout.

In the second experiment 6 lots of 21 lambs, averaging 63 lbs. in initial weight, were fed for 60 days on the following rations: Lot 1, shelled corn and alfalfa hay; lot 2, shelled corn, linseed meal, and alfalfa hay; lot 3, shelled corn, linseed meal, alfalfa molasses meal, and alfalfa hay; lot 4, shelled corn, linseed meal, and alfalfa molasses meal; lot 5, cracked corn, linseed meal, and alfalfa molasses meal; and lot 6, ground ear corn, linseed meal, and alfalfa molasses meal. The grains were hand fed, mixed, in both experiments, and the hay was fed in a rack, but in the second test the lots receiving alfalfa molasses meal were practically self-fed as the mixture of this meal and grain was kept before the lambs at all times.

At the conclusion of the experiments data were obtained from the packing house, giving for each lot the dressing percentage, the percentage of fat, and the grade of the carcasses. The feeding and slaughter data are summarized in the following table:

Supplements and substitutes in a ration of shelled corn and alfalfa hay for fattening lambs

Experiment	Lot	Average daily gain per head	Feed required per 100 pounds of gain							Dressing percentage	Percentage of fat
			Shelled corn	Barley	Linseed meal	Tankage	Corn silage	Alfalfa molasses meal	Alfalfa hay		
		Pounds	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Per cent*	*Per cent*
1	1	0.240	483.42						396.16	50.21	2.1
	2	.308	405.20		54.41				319.28	50.63	2.4
	3	.260	468.95				268.21		298.06	50.84	2.3
	4	.322	387.53		54.26		210.71		233.34	50.96	2.1
	5	.261	462.60			22.66			366.62	50.04	2.0
	6	.263		544.75					356.71	49.96	2.1
	7	.278	268.22	200.89					355.08	50.47	2.3
2	1	.305	413.69						269.99	46.50	2.0
	2	.370	377.28		39.62				217.51	47.30	2.2
	3	.457	339.73		38.51			112.72	91.02	48.00	2.4
	4	.402	371.13		43.80			204.61		48.00	2.3
	5	.483	[1] 344.52		37.62			186.47		48.60	1.8
	6	.412	[2] 404.76		38.55			180.41		48.60	1.9

[1] Cracked corn. [2] Ground ear corn.

In discussing the results it is pointed out that supplementing the basal ration of corn and alfalfa with linseed meal or corn silage, or both, resulted in larger gains, higher dressing percentages, and greater profits per head. Barley gave slightly better results than corn, but the practice of feeding barley during the first half and corn during the last half of the feeding period gave better results than when either grain was fed throughout the test. Additions of small amounts of alfalfa molasses meal to corn, linseed meal, and alfalfa hay improved the ration, but when alfalfa molasses meal replaced the hay the results were not so good. Cracked corn was superior to shelled corn, but ground ear corn appeared to furnish too much bulk when fed with alfalfa molasses meal.

[Swine feeding experiments at the Arkansas Station] (*Arkansas Sta. Bul. 203 (1926), pp. 27–29*).—The results of three experiments are briefly reported.

Legume hays v. tankage for wintering brood sows.—Five lots of 3 Duroc-Jersey gilts each were used for comparing ground soy-bean hay and ground cowpea hay mixed with corn at the rate of 2 parts of corn to 1 part of hay with corn and tankage for wintering gilts. Five of the 6 gilts which received soy bean hay aborted or failed to breed, while 5 of the 6 gilts which received cowpea hay farrowed normal litters. One of the 3 gilts receiving corn and tankage aborted, and there were several abortions in the swine herd, but blood tests for contagious abortion were negative.

Soft pork investigations with rice by-products.—This experiment was started with 43 pigs averaging from 63 to 100 lbs. per head. Three were killed and analyzed by the Bureau of Animal Industry, U. S. D. A., at the beginning of the experiment. Of the remainder, 24 were self-fed free choice 18 weeks on rice bran, tankage, and minerals. During the same period the other 16 were self-fed on rice polish, tankage, and minerals. At the end of the 8-weeks softening period each lot was divided into 2 groups for an 8-weeks hardening test. The 2 rations used for hardening were brewers' rice, tankage, and minerals. Slaughter tests showed that the fat was softer at the end of the feeding period on rice bran than at the beginning of the experiment. The fat was considerably hardened on the corn and brewers' rice rations, but those finished on the latter feed were firmer than those hardened on corn. Smaller gains were made on the softening feeds than on the hardening feeds.

Forage crops for swine.—Two fall and 2 spring litters from the same sows were used for testing the value of forage crops. The spring pigs made an average daily gain of 1.09 lbs. per head and the fall pigs 1.05 lbs. until weights of approximately 200 lbs. were obtained. The spring pigs required 128 lbs. and the fall pigs 212 lbs. of concentrates per 100 lbs. of gain in addition to the various forage crops.

Comparisons of 0.25-acre plats of various forages were carried out with 4 lots of 6 gilts each. The periods on the different forages were sweet clover 56 days, cowpea-soy bean pasture 44, sweet sorghum 48, and Sudan grass 56 days.

Pasture for pigs, W. E. J. Edwards, G. A. Brown, and G. A. Branaman (*Michigan Sta. Quart. Bul., 8 (1926), No. 3, pp. 99–103*).—In 1924 and 1925 4 lots of pigs were fed on forage, 2 in each year on alfalfa and 2 on rape. In 1924 one of the lots on alfalfa pasture received shelled corn, tankage, and minerals, all self-fed free choice, while the other lot on alfalfa pasture was hand-fed three-fourths the amount of grain consumed by the self-fed lot. Both lots on rape were self-fed, the one with corn, tankage, and minerals and the other with barley, tankage, and minerals. In 1925 similar rations were used except that linseed oil meal was included in all.

The combined results for the two years showed that the pigs fed shelled corn, tankage, and minerals, with rape pasture, made similar gains but required 55.67 per cent more protein supplements and a total of 4.15 per cent more feed per unit of gain than those fed on alfalfa pasture. For the 2 lots on rape pasture, the one receiving ground barley and the other shelled corn, the gains were similar, but on the barley ration 46.92 per cent less protein and 14.57 per cent more feed per unit of gain were required than on the corn ration. Limited feeding on alfalfa pasture produced slower gains and required 14.45 per cent more protein supplements but 5.04 per cent less total feed per unit of gain than full feeding. It is also pointed out that the acre plats used for pasturing the 15 pigs in each lot on alfalfa produced in addition 2,450 and 2,355 lbs. of hay, respectively, in the first and second years.

[Experiments with swine at the New Jersey Stations], F. G. Helyar (*New Jersey Stas. Rpt. 1924, pp. 106–109*).—The results of two experiments are briefly reported.

[*Weight variation in pigs*].—The weaning weights of 49 pigs are classed in groups differing by 0.1 lb. in the average daily gains made during the first 4 weeks after inoculation against hog cholera by the simultaneous method. The pigs of the higher weaning weights made the larger daily gains. The data indicate that the inoculation did not result in poor growth during the succeeding 4 weeks.

Hogging down corn trial.—Twenty pigs hogging down 0.5 acre of corn, with tankage and middlings self-fed, were compared as to the rate and economy of gains with another lot of 20 pigs fed corn, tankage, and middlings in dry lot. Both groups made an average daily gain of 1.56 lbs. per head. The amount of corn consumed by the lot fed on forage was estimated as the same as by those fed in dry lot, but less middlings and tankage were consumed by the former pigs. The elimination of the cost of cutting, shocking, husking, and hauling the corn made the estimate for the feed cost per pound of gain considerably less in the lot fed on forage.

Investigations of the effect on swine of fish meals containing large amounts of salt [trans. title], O. Rasenack (*Arch. Wiss. u. Prakt. Tierheilk., 52 (1925), No. 4, pp. 297–315*).—In studies of the effect of large amounts of salt in fish meal on swine, 16 30- to 40-lb. pigs were used, the feeding periods lasting

from 11 to 70 days. The pigs were each given 100 gm. of fish meal containing 5.48 per cent of salt per day. The amount of salt was increased for some of the animals, up to 100 gm. per day for 1 pig, by mixing additional salt with the fish meal.

The results of the experiments were somewhat irregular, but it appeared that from 5.48 to 10 gm. of salt per day was not injurious. Of 4 pigs receiving 15 gm. of salt daily, 2 showed no injury while the other 2 showed slight injury on the seventh and twelfth days, but recovery followed and no other ill effects were observed. Other animals were given 17.5, 20, and 25 gm. of salt each per day in the fish meal without injury, but larger amounts tended to be toxic, and 75 and 100 gm. daily caused death.

The tattoo method of marking hogs and its use, F. E. MURRAY (*U. S. Dept. Agr., Misc. Circ. 57 (1926), pp. II+11, figs. 8*).—A method of easily marking hogs by tattooing is described. The equipment consists of phonograph needles set in the form of numbers and letters in Babbitt blocks, which, in turn, are fastened to a handle for use. Black enamel is applied to the needles and the tattooing is done by striking the hog in a suitable place. Such markings are permanent and are clearly visible on the dressed carcass.

Salt for horses, R. S. HUDSON (*Michigan Sta. Quart. Bul., 8 (1926), No. 3, pp. 103–105, fig 1*).—This is a report of the amount of salt consumed by 12 horses having free access to salt in the stalls at all times. There was much variation in the individual consumption, the maximum being 3.26 oz. and the minimum 0.27 oz. per day. The average consumption was 1.82 oz. A distinct effect of season on salt consumption was also apparent. There was a constant increase from May to August, with a gradual decrease from that time until December when the test was discontinued. Due to the variation in the salt consumption of individual animals, it is suggested that horses should have free access to salt at all times.

On the interferometric method for the early determination of pregnancy in the horse [trans. title], J. W. AMSCHLER (*Landw. Jahrb. Bayern, 15 (1925), No. 1–2, pp. 1–10*).—Various means of determining pregnancy are discussed, and the results of tests by the interferometric method are described. Three tests of geldings and barren mares were negative. Tests on 12 pregnant mares were positive in 9 cases, and 3 cases were negative because of bacterial contamination. Some erroneous results were obtained in later tests, which the author believes were due to errors in the final determination of pregnancy rather than in the method employed.

A contribution to the question of the power of the horse's stride [trans. title], H. MAGERI (*Landw. Jahrb. Bayern, 15 (1925), No. 1–2, pp. 23–35*).—A study has been made of the length of the stride of the fore and hind legs of horses when led and when driven single or double pulling an empty or loaded wagon at different gaits. Records were also taken of the weights of the horses, temperature, respiration, and pulse, as well as various body measurements, including measurements of the angles of various joints. The length of the stride was determined on moist sand, and the number of strides made in a unit of time were also noted.

The results showed that the horses normally had the longest stride when led and that the length of stride was decreased as the load was increased, but the percentage decrease was less in the animals having the longer normal stride. In teams an effect of matings with different animals was apparent. The amount of work which the horse did tended to influence the physiological measurements, but in general there was an increase in body temperature and

the pulse and respiration were more rapid with work, the degree depending upon the amount of work done.

The saddle horse, W. G. L. TAYLOR (*New York: Henry Holt & Co., 1925, pp. IX+270, pls. 12*).—There are taken up in turn directions for the care, training, and riding of saddle horses, with special reference to the treatment and prevention of unsoundness and the characteristics of the groom.

[Experiments with poultry at the Arkansas Station] (*Arkansas Sta. Bul. 203 (1926), pp. 26, 27*).—Two exper ments were conducted with laying hens.

Comparison of vegetable and animal sources of protein for laying hens.—Buttermilk, beef scraps, peanut meal, and cottonseed meal were compared as the main sources of protein for laying White Leghorn pullets in a 126-day feeding period. The rate of egg production on the different proteins was, respectively, 62.4, 38.7, 21.6, and 34.1 per cent. The feeds did not appear to influence the weight of the eggs produced.

Value of rice by-products for laying hens.—The egg production of 3 lots of Plymouth Rock pullets, in which rice by-products replaced similar feeds in the standard laying ration, was compared in a 126-day test with the production of a fourth lot receiving the standard ration. The rate of egg production was 54.4 per cent on the standard ration, 62.5 per cent when brewers' rice replaced the corn in the grain and mash, 52.8 per cent when brewers' rice replaced the corn and rice bran replaced the wheat bran and wheat shorts in the mash, and 57.5 per cent when brewers' rice replaced the corn, rice bran replaced the wheat bran and wheat shorts, and rice polish replaced the otona (ground oats with the hulls removed).

[Experiments with poultry at the Indiana Station] (*Indiana Sta. Rpt. 1925, pp. 34, 35, figs. 2*).—Results of nutrition experiments are briefly reported.

Ultra-violet energy in cod-liver oil.—In one experiment, chicks receiving a rachitic ration with cod-liver oil in Pyrex flasks placed under the hover and in the feed trough were found to live twice as long as other chicks not having cod-liver oil in the pen. These results demonstrate that the antirachitic substance in cod-liver oil may be transmitted externally through the Pyrex flask to the chicks, indicating that some form of ultra-violet energy is stored in the cod-liver oil.

Feeding cod-liver oil to layers.—In another experiment 2 lots of laying hens were given cod-liver oil at the rate of 1 pint per 100 lbs. of mash, while 2 other pens received no cod-liver oil. The results did not show any benefit in the number, fertility, or hatchability of the eggs as a consequence of the cod-liver oil feeding.

Deficiency of corn in growth-promoting, water-soluble vitamin.—Baby chicks which made subnormal growth on a ration containing 69 per cent of corn but supplying adequate protein minerals and fat-soluble vitamins responded by making normal growth when the ration was supplemented by 10 per cent of dried brewers' yeast. Larger amounts of yeast did not have a more beneficial effect. Good growth also occurred when 20 per cent of wheat middlings were added to the corn ration.

Amount of cod-liver oil for chicks in confinement.—Tests of rations containing 0.5, 1, and 2 per cent of cod-liver oil for raising young chicks in confinement indicated that 1 per cent of cod-liver oil, even with rations low in minerals, would allow normal bone formation and prevent rickets during a 2-months period.

Protein of animal origin for poultry feeding, W. C. THOMPSON (*New Jersey Stas. Rpt. 1924, pp. 134, 135*).—The results of this study indicate that proteins from vegetable sources supplemented with suitable minerals are nearly as efficient for egg production as animal proteins. The animal proteins were

classified in the following order of efficiency: Dried skim milk, meat scrap, powdered buttermilk, and fish scrap.

Rickets, ultra-violet light, and milk, J. W. Gowen, J. M. Murray, M. E. Gooch, and F. B. Ames (*Science, 63 (1926), No. 1621, pp. 97, 98*).—The results of experiments are reported in which rickets in chickens were cured by feeding milk from cows exposed daily for from 15 to 30 minutes to ultra-violet light, while other chickens getting milk from cows not receiving this treatment tended to become progressively worse.

Thyroid feeding and secondary sex characters in Rhode Island Red chicks, H. B. Torrey and B. Horning (*Biol. Bul. Mar. Biol. Lab. Woods Hole, 49 (1925), No. 5, pp. 365–374, figs. 8*).—In continuing the study of the effect of thyroid feeding on feathering at the University of Oregon (E. S. R., 54, p. 865), 10 4-weeks old Rhode Island Red chicks were each given 50 mg. of desiccated thyroid daily for 2 weeks, 100 mg. for the next 3 weeks, and 150 mg. for the last 3 weeks of the experiment. Another lot of 10 similar birds was fed to 12 weeks of age as controls.

At 12 weeks of age there are no rectrices produced in the normal male, while they are well developed in the normal female. In the thyroid-fed male the rectrices were as well developed as in normal females. Thyroid feeding also tended to accelerate the development of both rectrices and contour feathers in the females as well as in the males. The characteristics of the male plumage of the thyroid-fed birds were similar to normal female plumage up to 12 weeks, but later the plumage of the thyroid-fed males became differentiated as normal male plumage, with certain modifications in the form and structure, especially in the hackle, saddle, back, and shoulder feathers. These modifications were toward the female type and, in general, consisted of a broadening and rounding of the tips of the feathers, with a narrowing of the lacing at the tip.

The Australorp, J. Keppie, D. Goddard, et al. (*Los Angeles, Calif.: Keystone Pub. Co., [1925], pp. 27, figs. 3*).—A popular account of the origin of the Australorp or Australian Black Orpington fowl, including a description of the breed.

Egg-hatching in China, P. A. Mohrbacher (*China Jour. Sci. and Arts, 3 (1925), No. 11, pp. 601–603*).—Artificial incubation as practiced in a very crude but extensive way in China is described.

Increase in egg weight in relation to the time that laying commences, M. A. Jull (*Amer. Nat., 59 (1925), No. 665, pp. 521–528, fig. 1*).—The author reports a critical analysis of the results of a paper previously noted by Hadley (E. S. R., 42, p. 770), in which a study of the relation of egg weight to production was made in a flock of 38 White Plymouth Rocks. The results are discussed in relation to a similar investigation conducted by the author in a flock of 60 Barred Plymouth Rock pullets (E. S. R., 52, p. 675).

It is pointed out that in the work with the White Plymouth Rocks proper consideration was not given to the importance of the age of the birds at the time laying commenced. The results obtained in the two investigations were, however, in general agreement, and seemed to indicate that birds showing the greatest percentage of increase in mean egg weight were the ones which laid the largest numbers of eggs. It is concluded that the increase in mean egg weight can be considered a criterion of numerical production only in so far as the time laying commenced is a criterion of numerical production, and thus increase in egg weight becomes a secondary character in relation to production.

The poultry industry of Wales, J. M. Jones (*Aberystwyth: Univ. Col. Wales, Agr. Econ. Dept., 1925, pp. 49, figs. 4*).—An account of the poultry industry in Wales.

DAIRY FARMING—DAIRYING

Dairy cattle: Selection, feeding, and management, W. W. Yapp and W. B. Nevens (*London: Chapman & Hall; New York: John Wiley & Sons, 1926, pp. XVII+378, figs. 120*).—This book deals with dairy cattle production under the following chapter headings: Selecting the dairy cow, choosing a breed, determining milk and butterfat yields, buying and selling dairy cattle, improving the dairy herd, caring for and marketing dairy products from the farm, filling the silo, feeding the dairy cow during the winter season, feeding the dairy cow during the pasture season, rearing the dairy calf, feeding and developing dairy heifers, feeding and managing the dairy bull, managing the dairy herd, treating the ailments of dairy cattle, keeping business accounts with the dairy herd, fitting animals for sale and exhibition, planning and equipping the dairy barn, and caring for manure.

[Experiments with dairy cattle at the Arkansas Station] (*Arkansas Sta. Bul. 203 (1926), pp. 25, 26*).—The results of two feeding experiments are briefly reported.

Rice meal v. corn chops for dairy cows.—Two lots of cows were fed by the reversal method during 8-week periods on a grain ration of corn chop or rice meal 2 parts, wheat bran 2, linseed oil meal 1, gluten feed 1, and cottonseed meal 1 part. The roughage consisted of alfalfa hay and corn silage. When the rice meal was included in the ration more milk and butterfat were produced and larger gains in live weight were made. Less feed was required per unit of milk and fat produced.

Cowpea hay v. alfalfa hay for dairy heifers.—One lot of 3 dairy heifers made an average daily gain of 1.42 lbs. per head during 18 weeks when fed cowpea hay, silage, and grain. A second lot made an average daily gain of 1.44 lbs. when alfalfa hay replaced the cowpea hay. Less hay but more grain was required per unit of gain on the cowpea hay ration. Better development and growth were observed on the alfalfa ration, thus indicating that this roughage was superior for the production of skeletal growth.

[Experiments with dairy cattle at the Indiana Station] (*Indiana Sta. Rpt. 1925, pp. 19, 20, figs. 2*).—Results of two experiments are very briefly reported.

Wintering dairy heifers.—Five lots of 4 dairy heifers each were used in a study of the value of roughage for wintering heifers. Those wintered on roughage alone gained an average of 1.10 in. in height and 0.277 lb. per day in weight, while those receiving hay, grain, and silage gained 3.65 in. in height and made an average daily gain of 1.54 lbs. per head. Heifers wintered in the dairy barn gained from 0.35 to 0.4 lb. more per day than heifers similarly fed in an open shed.

Supplementing pasture for milk production.—Three lots of 3 cows each were used for determining the comparative values of supplementing pasture and pasture alone. The lot receiving pasture alone returned a greater income during the summer than those receiving the supplementary feeds, but when the cows were placed in the barn in the fall those which had received grain or grain, hay, and silage maintained their milk production better than the cows which had received pasture only during the summer.

[Experiments with dairy cattle at the New Jersey Stations], J. W. Bartlett (*New Jersey Stas. Rpt. 1924, pp. 137–146, 147, 148, figs. 12*).—The results of two experiments are briefly reported.

The relation of the ductless glands to milk production.—In studying the effect of intramuscular injections of endocrine glands on milk secretion, preliminary milkings and butterfat tests were made for 2½ days before and 2½ to 3 days after injections into 5 cows. The substances injected included desiccated

placenta; desiccated mammary substance; desiccated thyroid; soluble extract ovarian residue; powdered fetus of cow, 4 to 4½ months; powdered fetus of cow, 5 months; pituitrol obstetrical; and corpus luteum of cow. The results were quite variable, especially with the different animals, but it is concluded that the glandular products have a depressor effect on blood pressure, which resulted in a decrease in the milk flow.

Experiment to determine whether alfalfa meal when fed to dairy cows causes garget.—Nineteen cows were fed alfalfa meal by three different methods during 2-week periods. No new traces of garget developed, but one cow showing symptoms at the start became worse during the experiment.

Feeding of concentrates to dairy cattle, O. E. Reed and C. F. Huffman (*Michigan Sta. Quart. Bul., 8 (1926), No. 3, pp. 118–122, figs. 4*).—This is essentially a progress report on the effects of heavy feeding with concentrates to growing animals. So far it has been impossible to raise calves on milk alone, milk and grain, or grain alone. The calves fed solely on concentrates die with symptoms of intoxication (convulsions or paralysis), and the post-mortem findings indicate a toxemia. The addition of oat hulls to a concentrate ration did not prevent convulsions, and wheat straw failed to prevent toxemia. In certain cases calves fed on concentrates alone developed a condition resembling rickets. The additions of minerals to whole milk rations tended to delay the onset of the pathological conditions. There was, however, much variability in resistance of animals to the toxins produced when rations of concentrates alone were fed. This was attributed to inherent stronger resistance in certain cases, as well as to the nutrition of the dam.

Dried apple pomace compared with dried beet pulp and with corn silage in feeding dairy cows for milk production, C. W. Holdaway (*Virginia Sta. Bul. 243 (1925), pp. 11, fig. 1*).—The comparative value of corn silage, dried apple pomace, and dried beet pulp was determined in a trial of 3 groups of 3 cows each. One group was fed the basal ration of corn silage and a grain mixture throughout the 80 days of the experiment. The 2 other groups both received the basal ration for 10 days, followed by 10 days during which 24 lbs. of silage was replaced by 8 lbs. of dried beet pulp in one lot and a similar amount of dried apple pomace in the other lot, both of which were soaked in 16 lbs. of water. The beet pulp and apple pomace feeding was continued for a 50-day experimental period, after which the 2 groups were again given the basal ration for a final 10-day period.

During the first 40 days of the experimental period the cows receiving the basal ration produced 2,680 lbs. of milk and 79.80 lbs. of butterfat but lost 76 lbs. in live weight. During the same period the cows receiving beet pulp produced 3,822 lbs. of milk and 117.10 lbs. of butterfat, losing 28 lbs. in live weight. Those receiving the apple pomace produced 3,716 lbs. of milk and 111.79 lbs. of butterfat, losing 163 lbs. in live weight.

An analysis was made of the milk and fat production on the different rations, and it was found that the milk production checked closely with the values of the feeds based on the total digestible nutrient content. This meant that 1 ton of dried beet pulp was approximately equal to 4 tons of corn silage, and 1 ton of dried apple pomace was approximately equal to 3 tons of corn silage.

A new fodder (siloed shisham leaves) for dairy cows, P. E. Lander and P. L. C. Dharmani (*Agr. Research Inst., Pusa, Bul. 158 (1925), pp. [1]+11, figs. 2*).—In feeding tests of the value of ensiled shisham (E. S. R., 54, p. 263) for dairy cattle four cows were used. The animals required some time to become accustomed to the new feed, which resulted in small declines in weight

and fluctuations in milk yield, but the consumption was increased as the cows became more used to the feed. No deleterious effect was observed either in the condition of the animals or in the quality of the milk. The composition of the shisham leaves at different periods during ensiling is also given.

Conditions demand better grown dairy cows, H. A. Hopper (*Cornell Countryman, 23 (1926), No. 5, pp. 149, 150, figs. 2*).—In addition to a general discussion of raising dairy heifers, the results of an experiment are reported in which alfalfa hay and timothy hay were compared as roughages for heifers 4 to 5 months of age. The test lasted 120 days, during which each calf received 2 lbs. of grain daily with hay ad libitum. The calves receiving alfalfa hay made an average daily gain of 1.37 lbs. per head and consumed 1.57 lbs. of grain and 9.2 lbs. of hay per pound of gain. The lot receiving timothy hay made an average daily gain of 1.04 lbs. and consumed 2.06 lbs. of grain and 9.7 lbs. of hay per pound of gain.

Progress in milk and butter-fat production, R. Cook (*Jour. Heredity, 16 (1925), No. 11, pp. 409–413, figs. 3*).—The cows holding the records for yearly fat production in the Jersey breed are tabulated, and it is shown that the improvement in the early records accompanied the development of a better knowledge of feeding and management as well as better breeding. It is also shown that many of the recent record cows have been related, indicating that breeding has had a considerable influence.

The history of the Kentucky Jersey herd, J. J. Hooper (*Jersey Bul. and Dairy World, 43 (1924), No. 9, pp. 359, 366*).—An account of the development of the Jersey herd at the Kentucky Experiment Station, which was founded from cows purchased in 1888 to 1894.

[Testing composite milk samples for butterfat], J. W. Bartlett (*New Jersey Stas. Rpt. 1924, pp. 146, 147*).—Daily butterfat analyses of the milk delivered on 15 days by 12 patrons at a commercial dairy were found to check closely with the butterfat analyses for the composite sample from each patron.

Mold growth was successfully prevented in composite milk samples by the use of glass-stoppered bottles, daily agitation of the samples, putting the full amount of corrosive sublimate in the jar at the start, thorough sterilization of the jars, disinfecting the stoppers with formaldehyde, and by storing in a cool dark place.

Hygienic milk production, with special regard to the vitamin and mineral ingredients of feeds, W. Müller-Lenhartz and G. von Wendt (*Hygienische Milchgewinnung mit Besonderer Berücksichtigung der Vitamine und Mineralbestandteile des Futters. Berlin: Paul Parey, 1925, pp. 99, pls. 5, figs. 4*).—A discussion of the precautions that are necessary in the production of clean milk and milk products, including an appendix dealing with the nutritive value of milk.

A study of bacteria producing a bitter flavour in milk, A. G. Lochhead (*Canada Expt. Farms, Div. Bact. Rpt. 1924, pp. 9–12*).—Two motile rods were isolated from bitter milk. One was found to produce bitter milk much more rapidly than the other, but the bitter flavor was produced more readily when both organisms acted together. The bitter organisms were found to grow best at ordinary temperatures, but the bitter flavor was produced more rapidly at lower temperatures, due to a checking of the growth of other acid-forming organisms. An increased exposure to the air also favored the development of the bitter flavor. In milk cultures the types producing the bitter flavor were killed at 176° F. or by pasteurization at 145° for 32 minutes. Further chemical tests of the nature of the bitter product indicated that it was formed from the casein of the milk, and the analysis pointed toward an increase in amino acids. The chemical separation of the bitter product indicated that it

was nonvolatile, insoluble in ether, soluble in water, and soluble in an alcoholic solution from which proteins were absent. It apparently had the complexity of an amino acid and appeared to be a peptide.

Factors influencing the contamination of milk, A. G. LOCHHEAD (*Canada Expt. Farms, Div. Bact. Rpt. 1924, pp. 4-8*).—The effect of various kinds of neglect and carelessness on the bacterial content of milk has been investigated and the results tabulated. It is shown that the cleaning of the utensils, the cleaning of the animals, and the frequency of removing the manure have important influences on the bacterial content of the freshly drawn milk. It is necessary to practice extreme care in all operations pertaining to milking, in order that a minimum bacterial count may be maintained.

Washing and sterilizing farm milk utensils, R. J. POSSON (*U. S. Dept. Agr. Farmers' Bul. 1473 (1926), pp. II+6, figs. 3*).—Popular directions for washing and sterilizing dairy utensils.

Grading dairy produce, G. S. THOMSON (*London: Crosby Lookwood & Son, 1925, pp. VIII+134, figs. 43*).—The methods and directions for grading milk, cream, butter, and cheese are given in detail, including references to various kinds of cheese and a chapter on refrigeration.

[Creamery inspection in New Jersey], J. W. BARTLETT (*New Jersey Stas. Rpt. 1924, pp. 150-153*).—A brief report of the inspection of creameries in New Jersey for the year ended June 30, 1924 (E. S. R., 50, p. 476).

A study of soft cheese making, M. E. LIMUACO (*Philippine Agr., 14 (1925), No. 3, pp. 143-154*).—The methods of making various native soft cheeses are described. Experiments dealing with the yield of the various types per liter of milk gave the following results: Santa Cruz and Lumbang cheese, using abomasum extract for curding 334 gm., and using Danish Hansen's rennet extract 342 gm.; San Pedro Tunasan cheese 421 gm.; Meycawayan cheese 572 gm.; Cebu cheese 257.5 gm.; and Pimento cheese 323 gm. The chemical composition of the different types of cheese is also given.

Effect of ingredients in the ice cream mix on its freezing point (*Indiana Sta. Rpt. 1925, p. 21*).—Cane sugar, milk sugar, souring, and neutralizing lowered the freezing point of ice cream, while milk fat and egg albumin, substituted for casein and gelatin, did not affect it.

Viability of Bacterium typhosum in ice cream, M. J. PRUCHA and J. M. BRANNON (*Jour. Bact., 11 (1926), No. 1, pp. 27-29*).—A brief account is given of a sample of ice cream which was inoculated with 25,000,000 typhoid bacteria per cubic centimeter before freezing. The ice cream was stored at a temperature ranging from −8 to +8° F., and tests of the bacterial content of the frozen cream during the storage period were taken at intervals up to 2 years 4 months, when the product was used up by the samples taken. It was found that the typhoid bacteria decreased quite rapidly at first but more slowly later, and some living typhoid germs were still present when the last sample was taken.

VETERINARY MEDICINE

Veterinary science [at the Indiana Station] (*Indiana Sta. Rpt. 1925, pp. 44-46*).—In this brief report the status of work with paralysis in hogs, cocklebur poisoning of swine, infectious abortion of cattle, limberneck in poultry, and fowl pest is discussed. An experiment is referred to which demonstrates the toxicity of decayed material when consumed by poultry during the warm months of the year and emphasizes the importance of cremating garbages and the carcasses of animals, especially chickens that die of limberneck. Inoculations made of healthy chickens with blood and blood filtrates from 30 flocks in order to differentiate fowl pest from other infectious diseases during an

outbreak resulted in the finding of 7 infected with European fowl pest, 12 with fowl cholera, and 1 with fowl typhoid, while 10 of the inoculated birds remained well.

[Report of the] division of live stock sanitation, V. S. Larson (*Wis. Dept. Agr. Bul. 69 (1924), pp. 101–112*).—Work with diseases of livestock is reported upon, particular attention being given to bovine tuberculosis eradication. Hog Cholera Control is reported upon by J. T. Purcell (pp. 107–109), and an account of State-Federal Accredited Herds is given by J. S. Healy (pp. 110–112).

[Annual reports of the Civil Veterinary Department of Bihar and Orissa for the years 1923–24 and 1924–25], D. Quinlan (*Bihar and Orissa Civ. Vet. Dept. Ann. Rpts. 1923–24, pp. [5]+17+XXIV+4, pl. 1; 1924–25, pp. [4]+18+XXIV+3, pl. 1*).—These are the usual annual reports (E. S. R., 51, p. 281) dealing with the occurrence of infectious diseases of livestock, control work, etc.

Veterinary Practitioners' Bulletin, [August, 1925] (*Iowa Agr. Col., Vet. Pract. Bul., 7 (1925), No. 1, pp. 63, figs. 34*).—The papers here presented are as follows: A Demonstration on the Diagnosis of Internal Parasites of Domestic Animals, by E. A. Benbrook (pp. 5–24); The Life Cycle of *Ascaris lumbricoides* of the Pig, by H. B. Raffensperger (pp. 25–30); Suggestions for a Better Basis for Sterility Work, by H. E. Bemis (pp. 31–42); Preliminary Report on Periodic Ophthalmia in the Horse, by W. F. Guard (pp. 43–50); and Fistula of the Withers in Horses, by H. E. Bemis (pp. 51–63).

The shoeing of the larger domestic animals [trans. title], A. Hanslian (*[Czechoslovakia] Min. Landw. Pub. 59 (1925), pp. 256, pl. 1, figs. 329*).—A German translation of the second edition of this treatise on shoeing.

Tetrachlorethylene, a new anthelmintic, A. S. Schlingman (*Vet. Alumni Quart. [Ohio State Univ.], 13 (1926), No. 4, pp. 118–120*).—Reporting upon experiments with this new anthelmintic, it is said that 1 cc. seems to be effective against the intestinal roundworms in average-sized fowls. Tests with dogs, cats, and foxes show it to be efficacious against hookworms and roundworms in these animals. It was also effective against stomach worms of sheep.

An experimental study on the pathology of the black-leg, H. Morita (*Tokyo Imp. Univ., Govt. Inst. Infect. Diseases Sci. Rpts., 3 (1924), pp. 97–102, pls. 2*).—The study is dealt with under the headings of clinical observation, morbid anatomy, histological findings, and distribution of bacilli in the cadaver. A list of 30 references to the literature is included.

Studies of anthrax immunity.—I, The attenuation of Bacillus anthracis by means of sodium chloride and other chemicals, S. J. Schilling (*Jour. Infect. Diseases, 38 (1926), No. 4, pp. 341–353*).—This is a contribution from the Arkansas Experiment Station. The author found that sulfuric acid and copper sulfate hydrolyze agar when added to this medium, even in such dilute concentrations as would not be expected to inhibit growth of *B. anthracis*.

"The addition of 4.5 per cent sodium chloride and the addition of 1 per cent potassium ferrocyanide to standard agar appears to represent about the maximum concentration of these chemicals which may be used without completely inhibiting the growth of the anthrax bacillus. The growth-inhibiting concentration of sodium hydroxide is about 0.15 per cent. An increased tolerance to sodium chloride, potassium ferrocyanide, and sodium hydroxide could be noticed in successive transfers of the anthrax bacillus, as judged by the production of a more luxuriant growth. After growing the anthrax bacillus for seven weeks on agar containing 1 per cent potassium ferrocyanide, and for

the same length of time on agar containing 0.15 per cent sodium hydroxide and testing the culture by inoculating guinea-pigs, no decrease in virulence of the organism could be detected. After growing the anthrax bacillus for six weeks on agar containing 5 per cent sodium chloride, marked attenuation of the anthrax bacillus was demonstrated by guinea-pig and rabbit inoculation. Attempts to immunize guinea-pigs with the sodium chloride attenuated culture failed. Presumably this was because sufficient intervals of time were not permitted to elapse between injections. It was found that rabbits could be successfully and safely immunized by the use of the culture attenuated by growing on 5 per cent sodium chloride agar, so that they withstood the injection of virulent cultures of the anthrax bacillus in quantities which are regularly fatal to normal animals."

The immunization of cattle against blackleg by means of toxin [trans. title], J. Basset (*Compt. Rend. Soc. Biol. [Paris], 93 (1925), No. 22, pp. 168–170; abs. in Trop. Vet. Bul., 13 (1925), No. 4, pp. 131, 132*).—It was found that the toxicity of filtrates from serum liver broth cultures of *Bacillus chauvoei* undergoes little or no change when they are kept in sealed vessels during periods ranging from 2 to 4 months, and that doses of 5 cc. of such filtrates conferred a high degree of immunity upon guinea pigs, enabling them to resist doses of 0.125 and 0.25 cc. of virus. In experiments with cattle the lethal dose of virus for a bovine of 15 months to 2 years of age was about 0.25 cc. of virus, or twice the lethal dose for the guinea pig. In a bovine inoculated simultaneously on the two sides of the body, on one with 10 cc. of toxin and on the other with 0.25 cc. of Pasteur vaccine No. 2 (apparently anthrax vaccine), the toxin did not lead to any aggravation of the symptoms, and the animal subsequently withstood a lethal dose of *B. chauvoci.*

Anthrax (*Arkansas Sta. Bul. 203 (1926), pp. 51, 52*).—Protective inoculation by means of aggressins is briefly referred to, as is the use of sodium chloride attenuated culture as a vaccine, and the multiplication of the anthrax bacillus in the soil and in stagnant water.

Foot-and-mouth disease research (*Jour. Min. Agr. [Gt. Brit.], 32 (1925), No. 7, pp. 610–613*).—This is a brief statement of work being done by the Foot-and-Mouth Disease Research Committee, a preliminary report upon which has been noted (E. S. R., 54, p. 275).

Observations on foot-and-mouth disease (*Jour. Compar. Path. and Ther., 38 (1925), No. 4, pp. 229–255*).—This paper is published by the permission of the Foot-and-Mouth Disease Research Committee of the Ministry of Agriculture and Fisheries, and is said to contain a more detailed account of the observations contained in the first progress report of the committee (E. S. R., 54, p. 275). The paper is in two sections: (1) Transmission of Foot-and-Mouth Disease to Rodents, by J. A. Arkwright and M. Burbury (pp. 229–238), and (2) The Attempted Cultivation of the Virus and Its Reaction to Various Agents, Chemical and Physical, by S. P. Bedson and H. B. Maitland (pp. 238–254).

The virus of foot-and-mouth disease [trans. title], T. Abe (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 28 (1925), No. 2, pp. 111–129; abs. in Trop. Vet. Bul., 13 (1925), No. 4, p. 140*).—In studies of the effect of various physical and chemical influences upon the virus of foot-and-mouth disease it was found that the lymph in the vesicles on the feet of infected guinea pigs reaches its maximum virulence in 24 hours, maintains that maximum for a further 24 hours, and then declines. The virus can be precipitated along with albumin by from 70 to 75 per cent alcohol, and the dried precipitated virus maintains its virulence for from 2 to 3 days and in a 50 per cent glycerin-salt solution for 10 days.

Further observations on louping-ill, S. STOCKMAN (*Jour. Compar. Path. and Ther., 38 (1925), No. 4, pp. 282–291*).—This is a report of work conducted in continuation of that previously noted (E. S. R., 42, p. 677).

Treatment of surra among horses with tartar emetic, UBADULLAH KHAN (*Indian Vet. Jour., 2 (1925), No. 1, pp. 30–36*).—The author reports upon the use of tartar emetic in the treatment of 14 animals (horses and mules) subcutaneously inoculated with 1 cc. of virluent blood and 26 cases that had naturally contracted the disease. He gives directions for administering the tartar emetic, which is cheaper than other treatments, but points out that patients in the chronic stage with their hind legs very weak or brain affected should not be put under treatment.

Tuberculosis order of 1925, F. L. C. FLOUD (*[Gt. Brit.] Min. Agr. and Fisheries, Diseases Anim. Branch Circ. Letters 13, 18–20 (1925), pp. 10*).—Circular Letter 13 calls attention to the tuberculosis order which took effect September 1, 1925, and includes changes as compared with the order of 1914, which it revoked. Circular Letters 18 to 20 give further information regarding the new order.

Report of committee on bovine diseases: Their relation to the milk supply and to the public health, C. D. PEARCE ET AL. (*Internatl. Assoc. Dairy and Milk Insp. Ann. Rpt., 14 (1925), pp. 102–108*).—This is a report made at the anual convention of the association held at Indianapolis, Ind., in October, 1925.

The abortoscope: A simple apparatus for the detection of infectious abortion of cattle, L. E. W. BEVAN (*Vet. Jour., 81 (1925), No. 604, pp. 476–479, fig. 1; abs. in Trop. Vet. Bul., 14 (1926), No. 1, p. 25*).—A description is given of a simple apparatus termed the abortoscope, which was first demonstrated by the author at a meeting of veterinarians and medical men held at Salisbury, England, in November, 1921. It is claimed that by its use the agglutination test is so simple that it can be carried out in the field with a considerable degree of accuracy.

Anti-abortion vaccines (*Arkansas Sta. Bul. 203 (1926), pp. 31, 32*).—In vaccination work with abortion disease of cattle, cultures of *Bacterium abortus* were killed by heat at 55° C. for 30 minutes, with 0.5 per cent phenol at 35° for 18 hours, and by 2 per cent tricresol, by ether, and by chloroform. Rabbits were inoculated with these suspensions, and at the end of 1, 2, 4, and 6 months their agglutination titer was compared with that of rabbits which had been similarly immunized with living cultures. The results obtained were not conclusive, but were sufficiently encouraging to make further work desirable. The agglutination titer of the rabbits receiving the suspension of organisms killed by 0.5 per cent phenol at 35° in 18 hours was fully as high in all tests as those which received four injections of a living virulent culture, and definitely higher than those receiving but one injection of living organisms.

Some recent advances in the protection of cattle and other animals against disease.—IV, Johne's disease, J. E. E[DWARDS] (*Agr. Jour. India, 21 (1926), No. 1, pp. 6–13*).—This, the fourth of the series of papers previously noted (E. S. R., 54, p. 871), deals with Johne's disease under the headings of diagnosis, methods of dealing with cattle, methods of preventing contamination of the healthy portion of the herd, and the possibilities of vaccination.

Inflammation of the bovine udder (mastitis) [trans. title], J. V. CATALÁ (*Porto Rico Dept. Agr. and Labor Sta. Circ. 89 (1925), Spanish ed., pp. 7, figs. 3*).—This is a brief practical account of this affection of the dairy cow.

A review of some modern theories of milk fever, W. L. LITTLE and N. C. WRIGHT (*Vet. Jour., 82 (1926), No. 4, pp. 185–191*).—The authors summarize the present knowledge of milk fever and attempt to show how far the more

recent theories are in harmony with the limited experimental results which have been obtained.

The aetiology of milk fever in cattle, W. L. LITTLE and N. C. WRIGHT (*Brit. Jour. Expt. Path., 6 (1925), No. 3, pp. 129–134, figs. 2*).—The first part of this account deals with the determination of the calcium content of the blood (pp. 129–133) and the second part with the determination of acetone bodies (pp. 133, 134). The determinations of the calcium content of the blood plasma of cows suffering from milk fever show that considerable diminution accompany the onset of this disease—in mild cases 20 to 30 per cent and in severe cases up to 60 per cent. The authors have been unable to demonstrate any significant increase in the total acetone bodies of the blood or urine in these cases.

An outbreak of bovine coccidiosis in Southern Rhodesia, E. W. BEVAN and M. H. KINGCOME (*Jour. Compar. Path. and Ther., 38 (1925), No. 4, pp. 292–294, fig. 1*).—The authors report upon an outbreak on an estate in the Hartley district of Southern Rhodesia.

Susceptibility of the sheep to anaplasmosis and the attenuation of the parasite by successive passages in this animal [trans. title], J. LIGNIÈRES (*Rev. Facult. Agron. y Vet. Buenos Aires, 5 (1925), No. 1, pp. 5–9*).—It is pointed out that the susceptibility of the sheep and goat to Anaplasma varies with the race of the animal and the virulence of the strain of Anaplasma.

The occurrence and distribution of Cysticercus cellulosae in Texas swine, E. W. PRICE (*Jour. Parasitol., 12 (1925), No. 2, pp. 81–83, fig. 1*).—The author reviews the available data on the occurrence of tapeworm infection in Texas. Records of the occurrence of human cases in 36 counties are listed, and a map showing the approximate location of the towns from which these cases are recorded is appended.

Diseases of the dog and their treatment, G. MÜLLER and A. GLASS (*Chicago: Alexander Eger, 1926, 5. ed., rev. and enl., pp. XVI+655, pls. 8, figs. [240]*).—This fifth edition of the work previously noted (E. S. R., 36, p. 183) has been entirely revised and is practically a new book, in the preparation of which the authors have been assisted by A. A. Leibold, P. Fischer, and A. Eger. The third German edition of the work has also been noted (E. S. R., 48, p. 182).

Speciation and specificity in the nematode genus Strongyloides, J. H. SANDGROUND (*Jour. Parasitol., 12 (1925), No. 2, pp. 59–80, pls. 2*).—The author concludes that the specificity for their hosts is the best means of determining the specific standing of parasites of the genus Strongyloides, but that it is necessary to observe certain considerations in the interpretation of the results of infection experiments. The infections of dogs with the human Strongyloides appeared to be permanently established, and, since the parasite which occurs naturally in dogs in the Orient is morphologically indistinguishable from *S. stercoralis* (Bavay), the parasite of dogs is held to be identical with the human form. The parasite of rats is differentiated on morphological and biological grounds from *S. papillosus* (Wedl.) from sheep and rabbits, and a new species, *S. ratti*, is erected for its reception. A new species from *Hydrochoerus hydrochoera* is described and named *S. chapini*.

Diagnosis of poultry diseases, F. R. BEAUDETTE (*New Jersey Stas. Rpt. 1924, pp. 119–132*).—This is a report of the diagnostic work of the year, the details of which are presented in tabular form.

Leg weakness and paralysis [of fowls] (*Connecticut Storrs Sta. Bul. 136 (1925), p. 439, figs. 2*).—It is pointed out that A. M. Pappenheimer and Cone have found the peculiar paralysis of growing and adult fowls which has caused much trouble in Connecticut to be a disease of the nervous system, the principal

lesions of which are in the brain and spinal cord. It is beyond ordinary methods of treatment, and, although apparently a contagious or infectious disease, its method of transmission is obscure.

Bacillary white diarrhoea of chicks, T. M. Doyle (*Jour. Compar. Path. and Ther., 38 (1925), No. 4, pp. 266–282*).—This contribution, from the veterinary laboratory of the Ministry of Agriculture of Great Britain, consists of a review of the literature in connection with a report of the results obtained in investigations conducted. The author concludes that bacillary white diarrhea is closely connected with artificial incubation. He finds that chicks can be infected by subcutaneous inoculation, by the alimentary tract, or through the conjunctiva. The gas-producing powers of *Bacterium pullorum* are said to be of a fluctuating character, some strains losing the power and others acquiring it after cultivation on artificial media.

"The agglutination test has proved of indisputable value for the detection of carrier birds; it is not, however, a speedy method of eradicating the disease from infected flocks. The test should only be employed for the detection of infected stock birds. It is unprofitable to apply it for the elimination of carriers from among chickens which have passed through an outbreak. About 50 per cent of chicks which survive an outbreak become carriers. The agglutination test serves the dual purpose of detecting carriers of avian typhoid and bacillary white diarrhea. The albumen of eggs laid by carrier birds does not agglutinate emulsions of *B. pullorum*. The egg production of carrier birds is seriously impaired as a result of the disease. Young chicks and adults can contract the disease from contact with carriers, probably through the medium of the contaminated ground. The *B. pullorum* does not occur in the healthy chick. Chicks which survive an outbreak should not be used for breeding purposes; this is the solution of the problem of bacillary white diarrhea."

Bacillary white diarrhea control in New Jersey, 1924–25, F. R. Beaudette and J. J. Black (*New Jersey Stas. Bul. 425 (1926), pp. 22, figs. 2*).—This is a report of control work in New Jersey started in the fall of 1924 in cooperation with the Bureau of Markets of the State Department of Agriculture, which culled the flocks and collected blood samples. Following a brief account of the nature of the disease, the subject is dealt with under the headings of collection of blood samples, technique of testing, interpretation of the test, nomenclature, what to expect after the test, distribution of infection according to breed and sex, and the value of the test. Tables are given which show the distribution of infection in certified and noncertified White Leghorns, Rhode Island Reds, and White Wyandottes, in all Barred Plymouth Rocks and Jersey Black Giants, in certified Jersey Black Giants, in miscellaneous stock, in different breeds of the Bergen County egg-laying contest for 1923–24 and of the Vineland egg-laying contest for the same period, and the distribution of infection by breeds in both contests, a summary of distribution of infection in certified birds of the various breeds, the distribution of infection in noncertified birds by breed, in certified and noncertified birds of all breeds tested, and the distribution of certified and tested birds by counties.

Of 28,103 birds tested, 6.43 per cent were found to be infected. The percentage of infection was greater in noncertified than in certified birds. The infection in pullets was slightly greater than in hens, but cock birds were more heavily infected than cockerels.

European fowl pest [trans. title], E. Leynen and R. Willems (*Ann. Méd. Vét., 70 (1925), No. 12, pp. 477–490, pls. 2*).—This is a summary of information on European fowl pest, with a list of 14 references to the literature.

Practical control of intestinal worms, F. R. Beaudette (*New Jersey Stas. Hints to Poultrymen, 14 (1926), No. 6, pp. 4*).—This is a brief practical summary of information.

Intestinal worms in chickens, B. H. Edgington (*Ohio Sta. Bimo. Bul., 11 (1926), No. 2, pp. 50–54*).—A practical account of transmission, prevention, and treatment.

AGRICULTURAL ENGINEERING

Agricultural engineering [studies at the Arkansas Station] (*Arkansas Sta. Bul. 203 (1926), pp. 21–23, figs. 2*).—Data are very briefly presented on tractors, farm electric light plants, farm building plans, and the development of farm water systems.

Experiments on the durability of fence posts indicated that galvanized metal posts showed no deterioration in the third year. Painted metal posts showed rust where scratched. Untreated oak posts and posts treated by dipping in creosote showed decay at the ground line. Commercially treated pine posts showed no decay.

[Agricultural engineering studies at the Indiana Station] (*Indiana Sta. Rpt. 1925, pp. 37, 38, fig. 1*).—It is stated that during a period of slightly over two years the wind-driven electric light plant has generated sufficient electricity for lighting the average farm home and for operating a small motor-driven appliance such as a vacuum cleaner (E. S. R., 53, p. 184). The generation was found to be greater during the winter and spring than during the summer and fall.

Field tests conducted during wheat and oats harvest verified the results of laboratory investigations of irregularities and imperfections of binder twine previously reported (E. S. R., 53, p. 184). Poor splices and loose fibrous places in the twine caused most of the difficulties. Twine which curled or kinked as it came from the ball caught on projections of the binder and caused the twine to break in some cases. Lack of uniformity in the thickness of the twine made accurate adjustment of the knotter impossible with some twine. Twines made of harsh fibers could not be tied in a tight knot, and frequently the end of the twine slipped out of the knot when the bundle was dropped upon the carrier.

Laboratory tests showed that carbide gas is a satisfactory source of heat for operating an incubator. A 1-cu. ft. burner approximately half open supplied sufficient heat and maintained a uniform temperature within a 120-egg incubator while the temperature of the room in which the incubator was operated varied from 54 to 92° F. After the burner was adjusted it required practically no attention until hatching time.

Data on the relation of electricity to agriculture are also included.

Surface water supply of the United States, 1923, Parts 2, 3, 7, 12 (*U. S. Geol. Survey, Water-Supply Papers 562 (1926), pp. IV+86, pls. 3; 563, pp. VI+258, pls. 3; 567, pp. IV+122, pls. 3; 572, pp. V+193+LI, pls. 3*).—These papers present the results of measurements of flow made on streams in the following basins during the year ended September 30, 1923: Parts 2, South Atlantic Slope and Eastern Gulf of Mexico Basins; 3, Ohio River Basin (in cooperation with the States of West Virginia, Ohio, Illinois, Kentucky, Tennessee, and North Carolina); 7, Lower Mississippi River Basin (in cooperation with the States of Missouri, Colorado, and Kansas); and 12, North Pacific Slope Drainage Basins.—A, Pacific Basins in Washington and Upper Columbia River Basin (in cooperation with the States of Washington, Montana, and Idaho).

Drainage on the farm, W. W. Weir (*California Sta. Circ. 304 (1926), pp. 30, figs. 20.*)—This circular is intended to cover the principles and methods of

drainage of wet lands in California, and is applicable to those parts of the State which do not require the special considerations essential in the drainage of lands where alkali is a factor.

Public Roads, [March, 1926] (*U. S. Dept. Agr., Public Roads, 7 (1926), No. 1, pp. 24+[1], figs. 28*).—This number of this periodical contains the status of Federal-aid highway construction as of February 28, 1926, together with the following articles: The Cook County Transportation Survey, by J. G. McKay; Effective Width of Concrete Bridge Slabs Supporting Concentrated Loads, by E. F. Kelley; and Efficiency in Concrete Road Construction.—Part V, Speeding up Construction Work, by J. L. Harrison.

Foundations of bridges and buildings, H. S. JACOBY and R. P. DAVIS (*New York and London: McGraw-Hill Book Co., 1925, 2. ed., pp. XIX+665, pls. [33], figs. [330]*).—This is the second edition of this book. It contains chapters on timber piles and drivers, driving timber piles, bearing power of piles, concrete piles, metal and sheet piles, cofferdams, box and open caissons, pneumatic caissons for bridges, pneumatic caissons for buildings, pier foundations in open wells, ordinary bridge piers, cylinder and pivot piers, bridge abutments, spread foundations, underpinning buildings, explorations and unit loads, pneumatic caisson practice, and references to engineering literature.

An investigation of the fatigue of metals, series of 1925, H. F. MOORE and T. M. JASPER (*Ill. Univ. Engin. Expt. Sta. Bul. 152 (1925), pp. 92, pl. 1, figs. 28*).—This is a progress report of studies on the properties of metals such as are used in the moving parts of machinery (E. S. R., 52, p. 387).

At elevated temperatures a marked difference was found between the ultimate tensile strength of various metals as determined by ordinary static tension tests and by prolonged and retarded tension tests. This difference became noticeable at temperatures varying from 400 to 800° F. As the temperatures increased beyond these limits the ratio of ultimate tensile strength, as determined by ordinary tests, to ultimate tensile strength, as determined by prolonged and retarded tests, also increased. Metals having a high nickel content showed the least decrease in ultimate tensile strength and proportional elastic limit as the temperatures were increased in both ordinary tests and in prolonged and retarded tests.

Fatigue tests of two steels subjected to reversed flexure at elevated temperatures showed that the endurance limits increased slightly from ordinary temperatures up to 900 and 500°, respectively. For other steels the endurance limit decreased slightly from ordinary temperatures up to temperatures of about 800°. The endurance limit decreased rapidly for all steels at temperatures above 900°.

The endurance limit approached the ultimate tensile strength given by prolonged and retarded tests above some particular temperature for each steel. This is taken to indicate that the results of a fatigue test at 1,500 cycles of stress per minute should be compared with the results of an ordinary static test rather than with those of a prolonged and retarded test.

Small holes were found to reduce the resistance of a specimen to reversed flexural stress from 57 to 82 per cent. The type of magnetic survey used was found to furnish an indication as to homogeneity or as to internal stress conditions in steel, but did not clearly distinguish good steel from poor steel.

It is suggested that, as a basis for determining a safe working stress for a nonferrous metal under repeated stress showing no well defined endurance limit, the stress which will cause failure be taken as that for which a logarithmic curve of stress and cycles thereof intercepts the coordinate which represents the estimated life of the machine in which the metal is incorporated.

Cold drawing was, in general, found to be very effective in increasing the static elastic strength and the static ultimate strength of nonferrous metals.

Cold drawing was much less effective in raising the fatigue strength of such metals. The proportionate improvement of such fatigue strength caused by cold drawing was much less for nonferrous metals than for steel.

It appeared that the ratio of endurance limit to ultimate tensile strength was distinctly lower for nonferrous metals than for wrought ferrous metals. Furthermore this ratio varied widely for different nonferrous metals and for different treatments thereof. It was found that the fatigue strength of nonferrous metals can not be determined reliably by short time tests in which the rise of temperature of the specimen is measured after about a thousand cycles of stress.

Case carburizing, accompanied by suitable heat treatment, was found to be a promising means of increasing the fatigue strength of low carbon steel under cycles of flexural stress. Increases of endurance limit as high as 162 per cent were noted.

Stresses in helically reinforced concrete columns, A. W. Zesiger and E. J. Affeldt (*Amer. Soc. Civ. Engin. Proc., 52 (1926), No. 1, [pt. 3], pp. 3–40, figs. 4*).—The object of this paper is to analyze the effect of helical reinforcement on the concrete core of a helically reinforced concrete column, and to develop formulas for the stresses occurring in the steel and concrete with varying percentages of reinforcement. The purpose is to indicate the lines along which further research would be highly beneficial.

It has been found that plain concrete columns of lengths up to at least $80\frac{l}{r}$ fail in shear rather than in compression. Before a plain concrete column can fail in shear, the imposed load must be sufficient to overcome the shearing resistance of the concrete and the frictional resistance of the material to incipient motion along the impending plane of rupture. Helical reinforcement is effective in resisting a shearing failure of the concrete core, and if sufficient reinforcement is used it is possible to preclude a shearing failure of the concrete. Helical reinforcement has little effect in preventing crushing of the concrete core of the column.

Even if the concrete shell outside the reinforcement in a helically reinforced column cracks off under a load only a little greater than is necessary to cause failure in an unreinforced column of the same dimensions and quality of concrete, the reinforcement tends to neutralize the effects of local imperfections in the concrete, thus increasing the reliability of the column. Furthermore, warning of impending failure is given in the reinforced column by the cracking of the outer shell of concrete. It is considered permissible, therefore, to allow a lower factor of safety and correspondingly increased working stresses in helically reinforced columns.

It is concluded that a rational analysis of the stresses in the steel and concrete of a helically reinforced concrete column is possible.

Chemical equilibrium in gases exhausted by gasoline engines, W. G. Lovell and T. A. Boyd (*Indus. and Engin. Chem., 17 (1925), No. 12, pp. 1216–1219, figs. 4*).—A correlation of the results of 58 exhaust gas analyses indicates that four of the components are in such proportions that the calculated value of the equilibrium constant K of the water-gas reaction $CO_2+H_2 \rightleftharpoons CO+H_2O$ lies for the most part within narrow limits, namely, 3 to 4, and that these limits are substantially the same for all conditions of mixture ratio and other variables. The magnitude of K obtained in this way corresponds to equilibrium conditions that prevail at temperatures of from 1,350 to 1,550° C.

The composition of the exhaust from gasoline engines at different fuel-air ratios confirms the hydroxylation theory of combustion of hydrocarbons, and further disproves the old belief that the reason for the maxima of the power

curves of gasoline engines occurring at about 85 per cent theoretical air lay in a preferential burning of hydrogen.

[Milk houses for California dairies], H. L. Belton and J. D. Long (*California Sta. Plan Ser. A, Nos. 1 (1925), pp. 11, figs. 7; 2, pp. 11, figs. 7; 3, pp. 14, figs. 9; 4, pp. 11, figs. 5; 5, pp. 14, figs. 12*).—Plans, specifications, and bills of material for structures listed in Circular 286 of the station (E. S. R., 53, p. 590) are presented. No. 1 deals with small milk houses for cream production from small dairy herds, No. 2 with a 6 ft. by 16 ft. milk house for milk or cream, No. 3 with a 10 ft. by 16 ft. general purpose milk house, No. 4 with a 12 ft. by 18 ft. milk house for medium-sized dairies, and No. 5 with 20 ft. by 32 ft. milk houses for large dairies.

Building plans and bill of materials for O. A. C. portable brooder house, A. G. Lunn (*Oregon Sta. Circ. 66 (1926), folder, figs. 8*).—Working drawings and a bill of material are presented.

O. A. C. portable poultry fence, F. L. Knowlton (*Oregon Sta. Circ. 69 (1926), folder, figs. 5*).—Working drawings and a bill of material for this structure are presented.

RURAL ECONOMICS AND SOCIOLOGY

A partial correlation analysis of farm organization and management data from Warren County, Iowa, C. W. Crickman (*Iowa Sta. Research Bul. 89 (1925), pp. 16*).—This is a technical report of one phase of the statistical analysis of data presented in a study previously noted (E. S. R., 53, p. 687). A discussion of the meaning of coefficients of correlation and how they are obtained is given, and the coefficients of gross and net correlation between each pair of 15 and 14 variables, respectively, in the data from 231 farms in Warren County are tabulated.

Discussing the factors that determine profits, the author points out that the zero order coefficient of correlation between total acres and profits being only —0.19 indicates that there is considerable variation in profits from farms of practically the same size, and that there is not so much of an apparent relationship between the two factors as group averages would indicate. Both measures indicate that large farms were less profitable. The coefficient of net correlation between profits and total acres being +0.12 indicates, on the other hand, that when the 13 other factors are accounted for additional acres increase rather than decrease profits. The larger farms that are unprofitable, therefore, must be so because they are weak in factors other than size. The inverse relationship measured by the zero order correlation coefficient between the factors is due to the high correlation between total acres and the three factors, acres in hay and pasture, acres in small grains, and months of man labor, all of which are correlated inversely with profits. There is practically an absence of correlation between value of real estate per acre and number of acres of hay and pasture, which means that less profitable hay and pasture land carried practically the same rent charge as crop land.

Hogs ranked second to poultry and sheep as the most profitable class of livestock on the basis of feed consumed, with cattle next. For every per cent of income that came from hogs instead of from poultry and sheep, profits were decreased 63 cts., from cattle $6.75, and from dairy products $4.48. Each per cent of receipts from crops added $3.31 more to profits than a per cent from beef and $10.94 more than a like amount from dairy products.

For every month of man labor that the farmer was able to dispense with without changing any of his enterprises, his profits were increased on the average by $67.50.

The net regression of —3.81 shows that profits were decreased on the average by $3.81 for each additional dollar added to the per acre value of real estate. On the basis of 174 acres as the average size of all farms, it is computed that deductions for rent averaged 2.17 per cent too high. All that real estate actually contributed to farm income on these farms in 1921 was 1.89 per cent on the investment.

For each additional acre of pasture used in carrying an animal unit the average decrease in profits was $189.44.

Causes of profit or loss on Virginia tobacco farms, J. J. Vernon and M. J. B Ezekiel (*Virginia Sta. Bul. 241 (1925), pp. 71, figs. 3*).—During the summer of 1923, farms in particular areas in Appomattox and Pittsylvania Counties, representative of the dark fire-cured and the old-bright tobacco belts of Virginia, were visited and complete farm records obtained for the year ended March 1, 1923. A complete financial statement was computed for each farmer showing his earnings for the year. It is indicated that in the particular year of this survey there had been an average increase in the cost of expense items of between 50 and 75 per cent. At the same time there had been an increase of more than 100 per cent in the price of tobacco.

Items of income and expense and operators' earnings are tabulated, and the variations in the operators' earnings are shown. Pages 20 to 45 of the publication are devoted to setting forth the differences between these farms or the ways in which they were conducted, to which may be attributed the variations in earnings. Variation in the value of tobacco sold per acre was found to be the most important cause of difference in earnings, while the area in tobacco was also important. The income from supplementary enterprises was important, especially in the dark tobacco region. The size and productivity of the tobacco enterprise had approximately seven times as significant an effect upon earnings as the supplementary enterprises in the dark tobacco area, and even more in the bright area. It is held, however, that under usual price conditions the supplementary enterprises would be somewhat more important. Returns from corn, wheat, dairy, poultry, and hog enterprises and from the garden contributed materially to the total farm earnings.

A statistical appendix gives the correlations between the four factors of value of tobacco sold per acre, acres in tobacco, income per plow acre other than in tobacco, and total plow acres in the farm, and between each of the four and labor income and labor income plus family use of products and rent. Detailed tables are also given (pp. 50–71).

An economic and social survey of 102 farms near Wuhu, Anhwei, China, Part 2, J. L. Buck (*Univ. Nanking, Agr. and Forestry Ser., 1 (1924), No. 7, pt. 2, pp. 28, pls. 2, figs. 2*).—This publication contains the complete details upon which the earlier report (E. S. R., 53, p. 597) was based.

[Investigations in farm management at the Indiana Station] (*Indiana Sta. Rpt. 1925, pp. 25–27, figs. 3*).—Brief summaries are given for several investigations.

[*Studies of the cost of producing pork*].—These investigations, carried on in cooperation with the Bureau of Agricultural Economics, U. S. D. A., indicated that 32 per cent of the cost of pork was incurred up to the time of weaning. Eighty per cent of the farmers studied made a profit in 1922 and 25 per cent in 1923. During these two years hogs furnished a market for corn at 68 cts. a bushel when the market price was 59 cts.

Soy bean cost study.—Data were secured from more than 100 farms in Carroll, Cass, Howard, and Miami Counties. The yields ranged from 12 to 17 bu. per acre. The production cost was between $1 and $1.50 per bushel, and the average sale price $1.81. Farmers with two years' experience or more obtained

2.5 bu. higher yield per acre, had nearly double the acreage, and made 13 cts. more profit per bushel than did those with less experience.

Farm leases.—It was found that one-fifth of the rented farms in Indiana are leased on the stock-share plan, and this appeared to be more profitable than other methods of renting. During the last five years the assessed value of renters' property has decreased nearly 50 per cent, at a time when cash renting has decreased the same percentage.

Sheep and wool production in southeastern Ohio, E. J. UTZ (*Ohio Sta. Bimo. Bul., 11 (1926), No. 2, pp. 76–81*).—The records of 13 farmers in Morgan and Noble Counties, who kept complete cost accounts on their flocks for four years, 1921–1922 to 1924–1925, are summarized here, and certain points deemed important to profitable sheep management are brought out.

[Costs of producing soy beans], G. W. MUSGRAVE (*New Jersey Stas. Rpt. 1924, pp. 223–226*).—Detailed and summary tables are given showing the man, horse, machine, and tractor labor costs of the operations of preparing the seed bed and seeding, cultivation, harvesting, and threshing 1 acre of soy beans in New Jersey. Separate reports are made for this crop grown for hay, seed, and soil improvement. The data represent a total of 42 farms covering 512 acres and present complete costs on 379 acres.

Cost of making maple syrup: Records of maple syrup production at the college for the period 1916–1925, A. K. CHITTENDEN (*Michigan Sta. Quart. Bul., 8 (1926), No. 3, pp. 141, 142*).—With 588 sugar maple trees, yielding 138 gal. of sirup in 1925, the cost per gallon was $2.35, with sap collection and boiling the principal items. See also a previous note (E. S. R., 51, p. 43).

The relation between the distribution of population and of cultivated land in the Scandinavian countries, especially in Sweden, O. JONASSON (*Econ. Geogr., 1 (1925) No. 1, pp. 107–123, figs. 14*).—Four maps, which have recently been prepared in Sweden and Norway representing the relation between land utilization and population, are discussed here. The data represented in them showing population density, the extent of arable land and woodland, and changes in agriculture are interpreted.

Income and taxes on Ohio farms, O. M. JOHNSON (*Ohio Sta. Bimo. Bul., 11 (1926), No. 2, pp. 84–86*).—Summaries of survey returns and farm accounts covering the period 1914–1924 are used to show the percentage of the farmer's net income that has been paid in taxes. It amounted to 13.8, 8.5, 30.5, and 16.2 per cent, respectively, in the four periods, 1914–1916, 1917–1919, 1920–1922, and 1923–1924.

Trend of taxes on agricultural land in Texas and distribution of the farmer's tax-dollar, F. A. BUECHEL (*Texas Sta. Bul. 334 (1925), pp. 4–42, figs. 27*).—This study was designed to set forth the facts relative to the taxation of agricultural lands in Texas and to analyze them. The data were obtained from the comptroller's reports and records and questionnaires sent to the county clerks or tax collectors in all of the counties of the State, complete information having been obtained in this way from 108 counties.

It is shown that the tax on rural land more than doubled between 1914 and 1923. The proportion of the total tax levied by local districts, as well as the absolute amount, increased for each year of this period. Furthermore, it varied widely between counties, while the percentage levied by the State and county was fairly uniform. The levy for State purposes increased from 34 per cent in 1914 to 35 in 1923, and more was used for public schools in the later year. That for county purposes declined from 42 per cent in 1914 to 37 in 1923, while for local district purposes it increased from 24 to almost 29 per cent. The proportion used for schools remained about the same, but that for roads was much greater.

A series of charts has been prepared showing the distribution of the farmer's tax dollar for each of six distinctive geographic areas of the State. There is evidence of considerable variation. The trend of the rural land tax per acre is upward for each of the principal crop areas, but it is much more pronounced in the corn and cotton sections. The most abrupt increase occurred in the black land section and in northeast Texas. The increase in tax per acre was relatively slight in the arid grazing lands of the western part of the State.

The fact that a relatively large part of the tax is levied by the State government and that a large proportion of this was distributed among the counties for the maintenance of public schools is regarded as very commendable.

Accidents in the agricultural industry, J. DESARNAUTS (*Les Accidents du Travail en Agriculture. Paris: J. B. Baillière & Sons, 1925, pp. 215*).—The French law of December 15, 1922, providing insurance against accidents to agricultural laborers is set forth in detail, consideration being given to the history of this legislation, its provisions, procedure under the act, and some of its advantages and shortcomings.

A review of the documents relating to the law of December 15, 1922, with respect to accidents in agricultural labor (*Recueil de Documents Relatifs a l'Application de la Loi du 15 Décembre 1922 sur les Accidents du Travail Agricole. Nancy: Berger-Levrault,* [*1923*], *pp. 150*).—Decrees and miscellaneous legal documents bearing upon the enforcement of the French law noted above, the regulation of mutual societies for accident insurance in agriculture, and legislation dealing with accident insurance in general have been brought together here.

Concerning wholesale market preferences for fruits and vegetables in Providence, R. I., R. B. CORBETT (*Rhode Island Sta. Bul. 203* (*1926*), *pp. 3–37, figs. 2*).—Fruit and vegetable growers in the Providence, R. I., market area were questioned as to what they wished to know concerning the selling qualities and the methods of sale of their products, and in accordance with their suggestions a questionnaire was drawn up covering best types or varieties, color and size preferences, the most desirable container, the usual length of time required to sell or turn over a quantity of produce, and the increase or decrease in the demand for a particular product. This was presented to wholesalers. Their answers have been tabulated as far as possible, and general impressions gathered by the author have been stated.

Marketing livestock cooperatively, T. MACKLIN and M. A. SCHAARS (*Wisconsin Sta. Bul. 381* (*1926*), *pp. 36, figs. 9*).—The benefits of farmer-owned local livestock shipping associations and cooperative commission firms at terminal markets are set forth, and directions are given for organizing a livestock marketing system. Certain management and marketing methods and practices are recommended for efficiency and profit. The appendix offers a suggested form of constitution and by-laws for cooperative livestock shipping associations which are incorporated as nonstock nonprofit associations.

Marketing Wisconsin foreign cheese by federation, H. H. BAKKEN (*Wisconsin Sta. Bul. 380* (*1926*), *pp. 28, figs. 6*).—A descriptive account is given of the foreign cheese industry, and the plans of leading dairymen in the foreign cheese-producing districts for organization into a federation made up of local cheese factory associations, a central sales organization, and two district cooperative cheese storage corporations are outlined in detail.

The grain trade of Montreal, C. F. JONES (*Econ. Geogr., 1* (*1925*), *No. 1, pp. 53–72, figs. 17*).—Conclusions are reached from an analysis of the grain trade of this port which have to do first with the relation of Montreal to the

grain trade of Canada and the United States, with particular reference to its competitive ability among the several Atlantic ports through which Canadian and United States grain is exported, and second with the relation of the grain trade activities to the natural environment.

From May to October, inclusive, Montreal is able to handle practically all of the oversea exports of Canadian grain. It handles an appreciable and an increasing portion of the total exports of United States grain, and it has port equipment equal to and in many respects superior to that of New York City, although handicapped by the present size of the St. Lawrence canals and also by the closing of the St. Lawrence to navigation from December to May.

The Canada Grain Act (*Internatl. Inst. Agr.* [*Rome*], *Texts of Laws, No. 20* (*1925*), *pp. 76*).—The full text is given of the act of June 27, 1925, which is concerned with Government grain inspection, grading, and supervision of elevators and grain handling.

Canadian grain trade year book, 1924–1925 (*Winnepeg: W. Sanford Evans Statis. Serv., 1925, vol. 5, pp. 100*).—This report continues the series of which an earlier volume was noted (E. S. R., 53, p. 396).

Crops and Markets, [March, 1926] (*U. S. Dept. Agr., Crops and Markets, 5* (*1926*), *Nos. 10, pp. 145–160; 11, pp. 161–176; 12, pp. 177–192; 13, pp. 193–208*).—The usual summaries are presented of supplies and current prices of important agricultural commodities, with analyses of the week's market conditions. Brief notes on foreign crops and markets are also given in each number.

Monthly Supplement to Crops and Markets, [March, 1926] (*U. S. Dept. Agr., Crops and Markets, 3* (*1926*), *Sup. 3, pp. 73–104, figs. 3*).—This number represents a report as of March 1 on farmers' intentions to plant in 1926, based upon returns from about 50,000 producers, and an analysis of the agricultural outlook made from that report. Farm stocks of grains, March 1, and of potatoes, January 1, and poultry and egg production reports are also featured.

The usual crop summary for the month; reports on farm prices; livestock receipts and disposition, milk market, cold-storage holdings, shipments of fruits and vegetables, and cotton statistics; and the review of the price situation are also given.

Government control of export and import in foreign countries, compiled by A. M. Hannay (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 12* (*1926*), *pp. IV+126*).—This is an annotated bibliography, in mimeographed form, arranged alphabetically by countries and chronologically under the country, current material being given first in order. It is attempted to give a brief historical summary of the subject from earliest times to the present, showing the results of control and often quoting authoritative opinions as to its harm or benefit.

Index numbers of production, wages, and prices, J. I. Falconer (*Ohio Sta. Bimo. Bul., 11* (*1926*), *No. 2, pp. 86, 87*).—Current notes are offered on the price level and the situation particularly with respect to Ohio farm products. The tabulation of index numbers covers the years 1913 to 1925, inclusive, and the months of 1924 and 1925, in continuation of the series previously noted (E. S. R., 54, p. 588).

The potential supply of wheat, O. E. Baker (*Econ. Geogr., 1* (*1925*), *No. 1, pp. 15–52, figs. 34*).—It is declared that the time is at hand when the leaders of the white race should take stock of the agricultural resources of the lands they hold and of the trend of population in order to determine upon a land policy and a population policy. Tentative estimates are given in this paper of the trend of population of the principal wheat-eating peoples on the earth and of the expected future need for wheat. Physical, economic, and geographic con-

ditions and economic principles which explain why wheat occupies the regions and the proportion of the land that it does are discussed.

Agricultural regions of Europe, O. Jonasson (*Econ. Geogr., 1 (1925), No. 3, pp. 277–314, pl. 1, figs. 38; 2 (1926), No. 1, pp. 19–48, pl. 1, figs. 34*).—The effect of manufacturing and the resultant concentration of population upon the agriculture of contiguous regions and even upon remote lands is here superimposed upon the analysis of the primary factors controlling the distribution of small grains in Europe, thus furnishing the physical and economic bases upon which the principal agricultural regions of Europe are discussed and described. They are the cold desert death zone, cold transition zone, temperate or small grains zone, subtropical or Mediterranean fruit zone, dry transition zone, and dry desert death zone. A map of the agricultural regions has been prepared in color.

The agrarian régime in Hungary [trans. title], A. Delos (*Rev. Écon. Internatl., 17 (1925), IV, No. 2, pp. 301–334*).—A brief general survey is given of the agricultural industry in Hungary, describing the chief crops grown, the landholding system, rural living conditions, home industries, and other minor phases. A program of aid for agriculture is suggested which emphasizes selective colonization and experimentation in agricultural science.

The agrarian law in Rumania and its economic consequences, Cécropid (*La Loi Agraire en Roumanie et Ses Conséquences Économiques. Thesis, Facult. Droit, Univ. Paris, 1924, pp. 111*).—Part 1 of this doctor's thesis in the political and economic sciences sets forth the agrarian situation in Rumania from 1864 to 1908; part 2 discusses the agrarian law of 1918 and its economic consequences.

The English agricultural co-operative movement, R. Hart-Synnot (*Nineteenth Century, 98 (1925), No. 586, pp. 903–915*).—This is a reply to certain of the views expressed by Easterbrook (E. S. R., 54, p. 285) and his conclusion that joint-stock companies may provide English farmers with the necessary business organization which, he held, they have not obtained through cooperative societies. The case is here presented for cooperative as against joint-stock organization for agricultural interests.

Co-operation at home and abroad, C. R. Fay (*London: P. S. King & Son, 1925, 3. ed., pp. XVI+481*).—The third edition of a volume noted before (E. S. R., 45, p. 897) introduces a second supplement dealing with agricultural cooperation in the Canadian West.

Report of the committee on social research of the American Sociological Society, 1924, W. F. Ogburn et al. (*Amer. Sociol. Soc. Pubs., 19 (1925), pp. 203–211*).—A survey to determine the nature and extent of research being done by the members of the society revealed 204 different research projects. The projects in rural sociology are listed as such, and a number of additional ones dealing with rural problems are classified under the headings of social psychology, standard of living, community life, education, race, population and migration, social economics, and social politics.

Farm populations, J. M. Gillette (*Amer. Sociol. Soc. Pubs., 19 (1925), pp. 135–143*).—In this paper, presented before the section on rural sociology at the 1924 meeting of the American Sociological Society, the author discusses various assumptions as to the relative decrease of the rural population in the United States. He holds that this decline may be conceived to be significant for the food supply of the nation and the world, and that it is the business of States to understand the issue and insure that farming be sufficiently remunerative to attract and retain the needed farm population on farms. The marked shift from rural to urban communities during the last census decade must involve serious effects on city and country because population conditions

social life, but not because the shifting population is inherently superior or inferior, biologically or morally.

Rural demography, W. S. Thompson (*Amer. Sociol. Soc. Pubs., 19 (1925), pp. 150–160*).—This paper was presented before the meeting above noted.

The author holds that although there is a serious lack of basic demographic data relating to rural communities and facts must be reached in a roundabout manner, certain ones may be regarded as established beyond reasonable doubt. They are (1) a larger proportion of the rural population than of the urban population marries, (2) the death rate of the rural population is lower than that of the city population, and (3) the birth rate is higher in the rural districts than in the cities.

The shifting bases of rural sociology, W. L. Bailey (*Amer. Sociol. Soc. Pubs., 19 (1925), pp. 161–164*).—This paper was presented at the meeting noted above.

It is declared that the rural sociologists must emphasize the relation of city and country and pass from the urban to the suburban concept. Attention is turning to progressive and growing rural districts and away from the traditional emphasis on decadence and depopulation. Current studies in rural sociology indicate recognition of gradations within the field and of the complex and growingly vital relationships of rural and urban problems.

Some researches in rural group analysis, J. H. Kolb (*Amer. Sociol. Soc. Pubs., 19 (1925), pp. 183–186, fig. 1*).—In this paper, presented before the section on social research of the American Sociological Society in 1924, the author reviews briefly some results of three kinds of group analysis as a method of studying rural society, the analysis of locality or ecological arrangements, that of the interest or intentional arrangements with particular emphasis upon institutional phases, and that of participation and group behavior with attention to attitudes. Specific examples of studies of each type are cited.

Commodity distribution in rural communities, C. R. Hoffer (*Amer. Sociol. Soc. Pubs., 19 (1925), pp. 186–188*).—Before the section meeting noted above, the author presented this report of a detailed study of 238 stores in 12 rural trade centers in Minnesota. The purposes of the study were to construct a quantitative expression of the activities and benefits associated with the sale of commodities in rural communities and to find out what conditions actually existed in these representative stores. The inadequacies of services at the trade center make the trade relations of the farmer disorganized and complex, and in a certain measure jeopardize the possibility of securing effective community organization. The time is at hand when trading service should consolidate as rural schools and churches are tending to do.

An estimate of rural migration and other sources of urban increase, J. M. Gillette (*Amer. Sociol. Soc. Pubs., 19 (1925), pp. 189–191*).—This brief study was presented at the meeting noted above. A national rate of natural increase was estimated, and the results obtained are presented in tabular form. The method is briefly discussed.

Service institutions for town and country, J. H. Kolb (*Wisconsin Sta. Research Bul. 66 (1925), pp. 63, figs. 14*).—Detailed studies were made of the high school, library, and hospital facilities in eight selected towns in Wisconsin ranging from 1,350 to 2,898 in population. These towns were selected as fairly typical of certain agricultural areas in the State and were found to have direct service relations with their surrounding farming communities.

The information procured on the high schools is presented under the heads of the kinds and forms of the service in the eight towns, service to town and country community, leadership and direction, costs and financial administration, some results as reported by the pupils themselves, improving the com-

munity service, an efficient service unit for a high school, and the service unit in terms of the community. The data are also tabulated. Similar phases of the situation and the problems of the libraries and the hospitals are discussed and tabulated data are presented.

The following table compares the unit requirements and costs per unit:

Suggestive unit requirements for three community service institutions

Kinds of institutions	Unit requirements and costs per unit					
	Minimum service unit	Total costs per service unit	Population required	Local costs per capita	Service area in square miles	Tax rate per $1,000 on assessed valuation of area for local costs
High school	100 pupils	$113.00	1,250	$7.20	41.7	$3.70
Library	30,000 book circulation	.13	4,000	1.00	133.3	.50
Hospital	30 beds	4.00	6,000	2.10	200.0	1.10

County and town budgets were examined in such a way as to give an itemized comparison on the percentage and the per capita basis of the total expenditures of the eight towns and the open-country districts of their respective counties. The hospital is conspicuously absent from the official budgets, the item of health representing 1.6 per cent for the towns and 0.2 for the country, or an average of 94 cts. per capita for the people of the towns and 8 cts. for those of the open country. The library appears only in the town budget, representing 1.1 per cent of the total disbursements, or an average of 64 cts. per person. In the eight towns the item of local education amounted to 29.6 per cent and in the counties to 29.7 per cent of the total budget. It represented $17.22 per capita for the towns and $12.06 for the open country.

It is pointed out that farmers and their families can hardly maintain these institutions without taking into account the neighboring village or town, and this leads to intercommunity relations and mutual exchange of services between the several groups. Furthermore, the costs of these institutions must be distributed and equalized over larger and more equitable units.

Rural hospitals, W. C. Nason (*U. S. Dept. Agr., Farmers' Bul. 1485 (1926), pp. II+46, figs. 21*).—The establishment of the first rural hospitals is outlined, and note is made of the State legislation, including the first passed in Iowa in 1909, that has made possible the erection of county, community, township, and district rural hospitals. These institutions are regarded as economic and constantly assuming wider community functions and responsibilities. They relieve the situation caused by the growing shortage of country doctors and meet a critical need in the way of service to farm dwellers.

Before deciding upon the erection of a hospital a community should determine by survey the need, the support of public sentiment, the size of the supporting community, the size of building needed, and financial resources. A definite permanent policy should be determined upon. Certain of the important questions involved in a building policy are pointed out, and special treatment is then given to specific types of rural hospitals, including county, county-home, township, town, district, community, community-private, and southern mountain hospitals. Detailed information is given regarding equipment, funds, and expenses of particular examples of each.

The 1925 farm census for Ohio, J. I. Falconer (*Ohio Sta. Bimo. Bul., 11 (1926), No. 2, pp. 83, 84*).—Comparisons are made between census returns of

1920 and 1925 with respect to the value of Ohio farm land and buildings, the size of farms, and tenancy.

Wyoming agricultural statistics, 1924, F. W. BEIER, JR., and A. D. FAVILLE (*Wyo. Agr. Statis. [Wyo. Dept. Agr.], No. 2 (1924), pp. 58*).—The second annual report follows one previously noted (E. S. R., 53, p. 395).

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Cooperative extension work, 1924, with 10-year review (*U. S. Dept. Agr., Coop. Ext. Work, 1924, pp. 131, figs. 32*).—An editorial discussion based upon this report is given on page 1.

FOODS—HUMAN NUTRITION

Studies of coffee making by precise methods, E. C. SPRAGUE (*Jour. Home Econ., 17 (1925), No. 4, pp. 206–211*).—In this investigation of the relative importance of various factors affecting the strength and flavor of coffee brewed by different methods, it was first established that a rather definite relationship exists between the specific gravity and quality of a coffee brew as regards strength, color, and flavor. The optimum specific gravity was placed at 1.0065, and this was used as the standard of comparison for brews prepared by the customary methods of boiling, percolation, boiling with egg, and filtration. As judged by the specific gravity of the brew and personal judgments of color and flavor, pulverized coffee was more effective than medium or coarse ground and filtration the most efficient method. Boiling with egg ranked second, while percolation and boiling without egg were decidedly inferior. The strength and color of the brew appeared to depend upon the fineness of grinding rather than on the particular blend, but sharpness of taste varied with the brand, the cheaper brands tasting neutral and flat.

Use of sodium nitrite in curing meats, W. L. LEWIS, R. S. VOSE, and C. D. LOWRY, JR. (*Indus. and Engin. Chem., 17 (1925), No. 12, pp. 1243–1245*).—To test the desirability of curing meats with nitrite instead of nitrate, pork hams, beef tongues, and beef hams were cured under packing house conditions in pickles differing only that in one series sodium nitrate and in duplicate series a smaller amount of sodium nitrite was used. The progress of the cure was followed by repeated analyses of the brine and meat for nitrite, sodium chloride, and sugar, and the final products were cooked in various ways and compared by competent judges. A similar comparison was made of bacon, dry or box cured, with nitrite and nitrate, respectively.

It was found that with the use of sodium nitrite in amounts of about one-tenth that of the nitrate the finished products were of as good, if not better, quality than the nitrate-cured products. The analyses of the pickle showed no appreciable differences in the rate of disappearance of the salt and sugar, a decrease in the nitrite content of the nitrite pickle, and an increase in that of the nitrate pickle. In the pork hams the nitrite content was much less than the maximum allowed in meats by the Bureau of Animal Industry, U. S. D. A. It is concluded that sodium nitrite in the amount used may successfully replace the usual nitrate in curing ham, bacon, tongue, and beef, but that much work remains to be done before the new agent can be applied with assurance to all types of cured meats.

Processing of food products (*Indiana Sta. Rpt. 1925, pp. 27, 28*).—A comparison of the length of time required to bring to the boiling point the liquid in cans placed in a wash boiler and steam cooker, respectively, showed that a longer time is required for the steam cooker than for the wash boiler.

With one can the times were 24.5 and 17 minutes, respectively. When filled to its capacity of 14 cans 48 minutes was required in the steam cooker as against 25 minutes for 11 cans in the wash boiler. It is recommended that 20 or 25 minutes be added to the time stated for processing in the true water bath if the steam cooker is to be used instead.

Fruit jellies.—III, Jelly strength measurements, L. W. Tarr (*Delaware Sta. Bul. 142 (1926), pp. 3–33, figs. 15*).—This continuation of the series of studies on fruit jellies (E. S. R. 51, p. 411) has been essentially noted from a paper by Baker (E. S. R., 54, p. 690).

Crude fiber in food, E. J. Magers (*Jour. Amer. Dietet. Assoc., 1 (1925), No. 2, pp. 73–77*).—Crude fiber determinations in duplicate or triplicate are reported, together with moisture determinations, for 23 different foods in various conditions.

Of the 45 analyses reported, all but 10 are of foods for which reliable data were not available. The foods tested included apricots, dried and canned; apples, small, medium, and large, with and without skin; bran and various breakfast foods; Graham bread; celery hearts and whole stock; figs, dry and soft; grape fruit; grapes; peaches, fresh, canned, and dried, with and without skin; canned pears, plums, cherries, and raspberries; dried prunes; seeded and seedless raisins; oranges in section and pulp; and tomatoes with and without skin.

The data showed little parallelism with existent figures on the same material and wide variations in different samples of the same food. The removal of skins from apples, peaches, and tomatoes resulted in a loss of from one-third to one-half of the fiber. The size of the fruit did not influence the fiber content consistently.

Variation in calcium content of common foods, M. Frank and C. C. Wang (*Jour. Home Econ., 17 (1925), No. 9, pp. 494–497*).—Attention is called to unexpected wide variations in the calcium content of staple foods from time to time. Thirteen duplicate and some triplicate determinations were made during the course of a year on 9 food articles taken from a regular hospital supply. The foods tested, with the average calcium content in milligrams of CaO per 100 gm. of material, were as follows: Cereal (farina) 31.3, bread (water) 40.5, bread (milk) 59, potato (cooked) 15, carrot (cooked) 68.3, orange 28.3, milk 157, meat 17.7, and egg 76.6 mg. The deviations from the average ranged from 4 per cent in eggs to 23 per cent in meat and the maximum variation in the different samples of each food from 11 per cent in milk bread to 58 per cent in meat. A comparison of the average values with those of the same food materials reported by other investigators showed wide discrepancies in many cases.

It is emphasized in conclusion that studies of calcium metabolism should be accompanied by determinations of the calcium content of the foods used instead of relying upon figures reported in the literature.

The loss of mineral and other constituents from vegetables by various methods of cooking, W. H. Peterson and C. A. Hoppert (*Jour. Home Econ., 17 (1925), No. 5, pp. 265–280*).—Data are reported on the content of calcium, magnesium, phosphorus, iron, and protein in asparagus, string beans, beet greens, cabbage, cauliflower, celery, celery cabbage, spinach, beets, carrots, kohl-rabi, onions, parsnips, potatoes (pared), sweet potatoes, and rutabagas in the fresh state and after cooking by boiling in small and large amounts of water, by steaming, and by the use of a pressure cooker. The time of cooking was generally 30 minutes for the boiled, 40 for the steamed, and 15 for the pressure-cooked samples.

In general the losses incurred on cooking increased in the order of steaming, pressure cooking, boiling in a moderate amount of water, and boiling in double the amount of water. The average losses for dry matter and crude protein were 15 per cent by steaming and pressure cooking, 30 per cent by boiling in a small amount of water, and 40 per cent in a large amount of water. The corresponding losses for calcium were 10, 20, and 30 per cent, and for magnesium 20, 30, and 45 per cent, respectively. The losses in phosphorus and iron were about the same as for magnesium by the first two methods and from 5 to 10 per cent higher for the last two.

Individual vegetables showed wide variations. The losses in cabbage were much greater than in cauliflower. Celery, beet greens, and onions suffered great loss, particularly in mineral constituents. An unexpected finding was practically no loss of calcium in spinach with any of the types of cooking. A possible explanation of this is that the calcium in spinach occurs as an insoluble compound such as silicate or pectate.

It is concluded that vegetables should be cooked by steam wherever this method is practicable, and that when boiling must be employed a minimum quantity of water should be used and wherever possible the liquid should be utilized in the preparation of other foods.

Dried human milk.—IV, Dried human milk as a food for infants, P. W. Emerson (*Amer. Jour. Diseases Children, 30 (1925), No. 6, pp. 769–773, fig. 1*).—A brief report is given of the use of dried human milk prepared as described by Smith (E. S. R., 52, p. 864) in the feeding of a small group of undernourished babies. The best results were obtained when the milk was supplemented by calcium caseinate. After having been kept on the dried human milk for a month or more the babies all gained well on a cow's milk formula, although previously unable to take it.

Dried human milk.—V, Its use in the feeding of premature infants, P. W. Emerson and L. W. Smith (*Amer. Jour. Diseases Children, 31 (1926), No. 1, pp. 1–21, figs. 12*).—This paper supplements the one noted above by the detailed reports of a series of 13 cases in which infants were fed dried breast milk over periods of time ranging from 4 to 137 days. Eleven of the subjects were premature infants weighing less than 5 lbs. Some of these were fed milk dried by the method first described (E. S. R., 52, p. 864) and others milk dried by a slight modification of the original method in which a lower temperature was used. In both groups there was a slow but steady gain in weight. This was more rapid in the second group, and it is thought that still further improvements in the method of drying are possible. The addition of protein in the form of dried fat-free breast milk or casein resulted in a more rapid gain in weight.

It is concluded that "dried breast milk is the nearest approach to a logical substitute for fresh breast milk which can be found; that by drying any surplus milk which can be secured, we have a method available for the preservation of the milk and a product which can be kept apparently quite indefinitely, until it is needed for some premature infant whose mother's supply gives out, or for some acutely sick baby in whose condition nothing but breast milk is indicated. It possesses the further advantage of being available at a distance for infants too sick to bring to the hospital and too far away for the fresh milk to be transported to them."

***Lactobacillus acidophilus*,** N. Kopeloff (*Baltimore: Williams & Wilkins Co., 1926, pp. XI+211, pls. 5, fig. 1*).—This monograph on *L. acidophilus* therapy is based largely on the author's investigations, which have been noted previously from various sources (E. S. R., 54, p. 191). A bibliography of 186 titles and various laboratory directions are appended.

Some features in the chemistry and physiology of the vitamins, A. B. MACALLUM (*Canad. Chem. and Metall.*, 9 (1925), No. 8, pp. 175–177).—A brief review and discussion of the literature on the attempted isolation and physiological properties of vitamins A, B, and C.

Deficient and surplus consumption of vitamine B: Their quantitative relation to weight-changes and to vitamine storage in adult pigeons, J. D. PILCHER and T. SOLLMANN (*Jour. Pharmacol. and Expt. Ther.*, 26 (1925), No. 3, pp. 203–213, figs. 4).—In this study of the quantitative relation of vitamin B to growth, appetite, and storage, adult pigeons were fed corn until their weight became constant. The corn was then replaced by polished rice, and measured quantities of Harris yeast extract ranging from 10 to 960 mg. daily were given in gelatin capsules for 21 days, during which time records were kept of the weight changes and consumption of rice. The yeast was then discontinued, and the pigeons were given polished rice only until the occurrence of polyneuritis or death.

On plotting the weight loss against yeast dosage, a smooth parabolic curve was obtained showing a simple relationship between the vitamin dosage and body weight. After the yeast was withheld, the curves of loss of weight ran nearly parallel for the pigeons which had received no yeast and amounts up to 240 mg. daily. With larger amounts the loss in weight was delayed for about a week, thus demonstrating a very limited storage capacity of pigeons for vitamin B, as had previously been shown by Steenbock, Sell, and Jones (E. S. R., 49, p. 665) and others for rats.

A comparison of vitamin dosage with food consumption showed that the two paralleled each other, and that the optimum quantity of rice, 17.6 gm. daily, was eaten with a daily dosage of 240 mg. of yeast extract.

The majority of the pigeons died without developing polyneuritis, although a few developed it before the loss in weight was marked.

Vitamin C in fresh and canned pineapple, C. D. MILLER (*Jour. Home Econ.*, 17 (1925), No. 7, pp. 377–382, figs. 2).—Supplementing an earlier study on the content of vitamins A and B in fresh and canned pineapple (E. S. R., 51, p. 167), a similar study is reported for vitamin C.

Five gm. daily of the fresh pineapple proved sufficient to cure guinea pig scurvy. The same amount of canned pineapple proved insufficient, but a mixture of 7 gm. of canned pineapple and 5 cc. of juice, the whole corresponding to 7.7 gm. of fresh pineapple sufficed for renewal of growth and prevention of scurvy. The H-ion concentration of the fresh juice and the juice of the canned product lay between pH 3.5 and 4, an acidity higher than that of canned tomatoes. This is thought to indicate that the apparent slight destruction of vitamin C in the canned product could not be attributed to a decrease in H-ion concentration.

Reproductive dietary complex (vitamin E) (*Arkansas Sta. Bul. 203 (1926), p. 31.*)—In this progress report (E. S. R., 53, p. 565) evidence is summarized leading to the assumption that certain vegetable oils contain in addition to vitamin E a hitherto unrecognized dietary complex that controls milk secretion.

Linseed, coconut, sesame, palm kernel, rapeseed, mustard seed, and sweet almond oil were found to be deficient in the antisterility or reproductive vitamin E. Peach kernel, olive, peanut, and soy bean oils and cacao butter contained the antisterility factor but were deficient for milk secretion. Wheat oil, crude corn oil, cottonseed oil, and palm oil contained both the antisterility factor and the substance influencing lactation.

From wheat oil a concentrate was prepared of which 1 mg. daily sufficed to prevent sterility, but more was necessary for successful lactation. With 2

mg. 9 out of 60 young were reared, and with 4 mg. 75 out of 100. Heating wheat oil for 2 hours at 20 lbs. pressure apparently destroyed the lactation factor but not the antisterility factor. This was also true of heating for 24 hours at from 85 to 90° C. in the presence of a stream of air. It is stated that work in progress indicates that the mammary gland has only a limited power to store the lactation factor.

Nutritional requirements for normal reproduction, G. A. HOGAN and H. M. HARSHAW (*Jour. Metabolic Research, 5 (1924), No. 1-3, pp. 111-128, fig. 1*).—In this general discussion of the question as to whether there is a specific vitamin for reproduction, data are reported on the reproduction records of rats on six synthetic diets of casein, starch, milk fat, cod-liver oil, yeast, and salt mixture and in some cases agar.

All of the rations used sufficed for the birth of a considerable number of litters, but the mortality of the young was high, the number of litters was subnormal, and the young that survived grew slowly while dependent on their mothers for food. No definite conclusions were drawn beyond the opinion that the failures were due to inadequacy of the rations for normal lactation.

Rickets, ultra-violet light, and milk, J. W. GOWEN, J. M. MURRAY, M. E. GOOCH, and F. B. AMES (*Science, 63 (1926), No. 1621, pp. 97, 98*).—To test the hypothesis that ultra-violet irradiation of the mother might increase the antirachitic value of breast milk, Holstein-Friesian cows of nearly the same age and calving dates were kept side by side in the same barn and given the same feed. For one month none of the cows received ultra-violet treatment, for the second month 2 were irradiated daily for 15 minutes by a Cooper-Hewitt alternating current light 3 ft. above their backs, and during the third month the same cows were irradiated 30 minutes daily. The milk of all of the cows was tested for antirachitic properties by curative and prophylactic feeding experiments on White Leghorn chicks.

The milk of the irradiated cows proved richer in antirachitic properties than that of the nonirradiated, although not so effective in the treatment of rickets as suitable amounts of cod-liver oil or direct irradiation. It is suggested that the high incidence of rickets in breast-fed babies during the late winter months may be due in part to their mothers not receiving enough ultra-violet light either during pregnancy or while in lactation. "Furthermore, it would appear that cows' milk produced especially for baby feeding should be from cows which have access to ultra-violet light either from the sun or some other source."

The influence of insulin treatment on the fat content of the bodies of rats in avitaminosis and under various food restrictions **[trans. title],** K. ONOHARA (*Biochem. Ztschr., 163 (1925), No. 1-3, pp. 51-60*).—This and the following two papers supplement previously reported investigations of Bickel and Collazo (E. S. R., 50, p. 863) on the mechanism of the action of insulin and of Asada (E. S. R., 50, p. 860) on fat metabolism in avitaminosis.

In the present study the effect of insulin treatment on fat metabolism was followed in four groups of rats fed similarly to those in the studies reported by Asada, except that to half of the animals in each group insulin was administered daily in a dosage of 0.8 unit per kilogram of body weight, an amount corresponding to 48 units daily per 60 kg. man. At the end of the experimental period, consisting of 3 weeks for all the groups except those on fat alone, which continued for 6 weeks, the animals were weighed, killed, and their bodies analyzed for fat. The rats on the mixed vitamin-containing diet gained in weight, those on the vitamin-free diet either gained a little or maintained their weight, those on starch alone gained slightly, and those on fat

lost weight. The fat content of the bodies of the rats in the successive groups decreased, but aside from those on the mixed vitamin-containing diet, there was no appreciable difference in the fat content of the insulin-treated and control animals. This is thought to indicate that insulin exerts no fat-sparing action such as was shown by Bickel and Collazo to be the case with carbohydrates.

The influence of the mineral content of the diet on the fat content of the body [trans. title], K. ONOHARA (*Biochem. Ztschr., 163 (1925), No. 1-3, pp. 61-66*).—A comparison is reported of the fat content of the bodies of rats fed identical diets of wheat protein and fresh carrots in the morning and rice, butter, and distilled water in the evening, one-half of the animals receiving with the morning ration 0.1 gm. of calcium chloride, 0.2 gm. of magnesium chloride, 0.2 gm. of sodium chloride, or 0.05 gm. of potassium chloride per animal. At the end of 21 days the animals were killed and their bodies analyzed for fat.

The fat content of those receiving the first three salts averaged 1 per cent higher than the controls. Only 2 of the 5 receiving potassium chloride lived to the end of the experiment. The average fat content of these two was slightly below that of the controls. It is concluded that the ion content of the body fluids and body cells is not without influence on the fat content of the body.

The effect of insulin on the blood fat content of avitaminous dogs [trans. title], K. ONOHARA (*Biochem. Ztschr., 163 (1925), No. 1-3, pp. 67-74*).—In this study evidence is presented that insulin has no appreciable effect upon the blood fat or blood sugar of dogs in the early or late stages of vitamin starvation.

The reduced sensitivity to insulin of rats and mice fed on a carbohydrate-free, excess-fat diet, H. W. BAINBRIDGE (*Jour. Physiol., 60 (1925), No. 4, pp. 293-300*).—In a series of experiments involving the use of a large number of rats and mice, it was demonstrated that by the substitution of fat for all of the carbohydrate in a balanced diet furnishing vitamins A and B the resistance of the animals to insulin was markedly increased. The substitution of carbohydrate for fat appeared to render the animals more sensitive to insulin, but this point is considered to be not definitely proved. It was shown that the variations in sensitivity were not due to deficiencies in the amount of vitamin A present. The evidence obtained as to the importance of the thyroid gland was inconclusive.

The use of high carbohydrate diets in the treatment of diabetes mellitus, W. D. SANSUM, N. R. BLATHERWICK, and R. BOWDEN (*Jour. Amer. Med. Assoc., 86 (1926), No. 3, pp. 178-181*).—Arguments, based upon the authors' experience in the treatment of diabetes at the Santa Barbara Cottage Hospital, are presented for the use of more liberal amounts of carbohydrate in diabetic diets than is usually the custom. The new diets are essentially normal except for the omission of sugar and foods actually sweetened with sugar. They contain white bread, potatoes, milk, and exceptionally large servings of fruit. In addition to adequate protein, the diets furnish 2 gm. or more of carbohydrate to each gram of fat. To keep the patient sugar-free more insulin is required, but there appears to be a tendency to a gradual decrease in the insulin requirement after prolonged use of such diets. Tables are given of routine diet formulas up to 3,000 calories, of a standard diet of 2,200 calories, and of typical case summaries with diet and insulin dosage.

It is stated that with the use of high carbohydrate diets there has been no difficulty in keeping the patients sugar-free, with a normal blood sugar, and

free from the slightest traces of the acetone type of acidosis. The acid-ash type of acidosis, which is thought to be responsible for the frequent occurrence of high blood pressure as a complication of diabetes, is eliminated by the use of potatoes, milk, and fruit. Because of the entire freedom from acidosis, the new diet is thought to afford the patients the best opportunity for partial recovery, and this seems to be confirmed by the decrease in insulin requirement noted in many cases. Other arguments in favor of the new diets are that patients are restored to a more nearly normal state of physical and mental activity and lose their craving for forbidden foods, and that the diets are more palatable and cheaper because they contain no special foods and much less of the expensive fats.

Studies on diabetes, K. Petrén et al. (*Jour. Metabolic Research, 5 (1924), No. 1–3, pp. 1–82*).—This is a summary in English of much of the subject matter of a Swedish monograph on diabetes published in 1923, together with a translation of the preface (pp. 1–5) to this volume by B. Naunyn.

The text is of particular interest in that it expounds the authors' theory that the best dietary control of diabetes lies in extreme restriction of the protein intake, with a corresponding increase in the fat.

Food poisoning: A study of 100 recent outbreaks, W. G. Savage and P. B. White ([*Gt. Brit.*] *Med. Research Council, Spec. Rpt. Ser., No. 92 (1925), pp. 112, figs. 2*).—This report describes the results of a detailed epidemiological and bacteriological investigation of 100 consecutive outbreaks of food infection in England. The description of the essential features of the outbreaks, with tabulated data, is given in fine print in an appendix, while the text proper consists of an analysis of the data from various points of view.

Of the 100 outbreaks, which were taken without selection and included mild as well as severe, 3 were classified as probably not true food poisoning, 66 as due to members of the Salmonella group, 4 to the dysentery group, 1 to *Bacillus botulinus*, 2 of definite chemical origin, 8 cheese poisoning, 9 mild evanescent outbreaks, and 7 outbreaks of undetected bacterial origin. Among the epidemiological features brought out are that the majority of the outbreaks occurred during the summer months, that in all but 4 cases the food did not appear spoiled, that canned foods (mostly meat and fish) constituted 42 per cent of the incriminated food, that the infectivity rate was high, and that an unusually large number of the outbreaks occurred in institutions.

Clinically, with the exception of botulism and a few other outbreaks of peculiar nature, the various outbreaks showed strong resemblance, the symptoms almost invariably being those of gastrointestinal irritation. Based on the time of incubation and the severity of the symptoms and aftereffects, 3 clinical groupings were made. These in increasing order of severity were (1) cases of simple gastrointestinal irritation without absorption of toxin, (2) outbreaks due to undestroyed toxins of the Salmonella groups, and (3) infection with living Salmonella bacilli. The single outbreak of botulism was the Loch Maree outbreak (E. S. R., 49, p. 862), which is thought to be the only one which has occurred in the British Isles. The etiology of the outbreaks in which the incriminating food was cheese was very obscure. From a careful examination of the data and some bacteriological studies carried on upon cheeses, the conclusion was drawn that the most plausible cause was the undestroyed toxin of some specific bacillus, in most cases members of the Salmonella group.

In discussing the paths of infection, particularly as regards the Salmonella group, three possibilities were suggested: (1) A habitat outside the animal body, (2) infection from a human case, and (3) infection from an animal source either through the use of meat or milk from an infected animal or the

contamination of sound food with bacilli from an infected animal. It is considered that in the majority of cases the last-named possibility was the most likely.

Suggestions are given for means of preventing and investigating such outbreaks as have been described.

TEXTILES AND CLOTHING

Catalogue of Government publications dealing with textiles and textile fibers, compiled by F. WELLS (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Spec. Bul. 422 [1925], pp. 25*).—The textile publications issued by the United States Government during the past decade are grouped according to the major textile fiber or product discussed—raw cotton; control of cotton pests; cotton manufactures; wool, mohair, alpaca, silk, rayon, and miscellaneous vegetable fibers other than cotton, and manufactures thereof; knit goods; and wearing apparel. The larger regular publications of different bureaus which contain information of interest to the textile trade and to other basic industries are listed, and the duties and functions of the agencies concerned are described.

United States Government general specification for textile materials (methods of physical and chemical tests) (*U. S. Dept. Com., Bur. Standards Circ. 293 (1925), pp. 8, figs. 5*).—The test methods outlined deal with atmospheric conditions, fiber identification and quantitative determinations for cotton, wool, and wool and cotton mixtures, breaking strength by grab and strip methods, weight per square yard and linear yard, thread count, and width.

1925 Year Book of the American Association of Textile Chemists and Colorists (*New York: Howes Pub. Co., 1925, pp. 29–217, 241, figs. 16*).—The organization and activities of the association are described, and standard methods are supplied for determining the fastness of dyestuffs on the fiber. These include fastness tests for dyed silk to domestic washing and laundering and to fulling; for dyed wool to washing or laundering, to fulling, scouring, and mill washing, and to dry and wet heat; and for dyed or printed cotton to washing, to fulling against white cotton, silk, and wool, and to chlorine. Reports on tests for fastness to perspiration, light, acids and alkalies, carbonizing, and to sea water are also submitted. American dyes are tabulated alphabetically and according to Schultz numbers and color index numbers.

The bleaching, dyeing, and chemical technology of textile fibres, S. R. and E. R. TROTMAN (*London: Charles Griffin & Co., 1925, pp. XI+610, figs. 163*).—A college textbook based upon courses of lectures given in University College, Nottingham, England.

Minute structure of fibers [trans. title], R. O. HERZOG (*Naturwissenschaften, 12 (1924), No. 46, pp. 955–960 figs. 2; abs. in Jour. Soc. Chem. Indus., 44 (1925), No. 37, p. B704*).—According to investigations made at the Kaiser Wilhelm Institute for Textile Chemistry in Berlin-Dahlem, a study of the Röntgen diagram of cellulose in monochromatic light shows certain deviations and divisions of the points explainable only by the existence of more than one crystalline substance. The concentric layers of bast fibers exhibit under the microscope parallel fibrillae (Nägeli's micellae) which possess an inclination to the axis characteristic for each layer. The bast fibers of hemp, mulberry, and broom give distinct fiber diagrams comprising a complex of layers. Ramie fiber shows two complexes of layers, flax is indefinite, and cotton has a diagram characteristic of a spiral arrangement. Mercerization produces changes in the molecule of the constituent of cellulose which shows the maximum interferences, without sensibly affecting the molecular size. Artificial silk shows the same diagram

as mercerized cellulose. Silk fibroin and chitin show a certain similarity to cellulose; the main body is either a single crystalline substance or a mixture of such. The crystals lie with an axis in the direction of the fiber and are embedded in a cementing substance; the elementary crystal particles are similar in dimensions to those of other organic compounds. The formation of fiber structure in the organism takes place through the crystallization of the amorphous substance in consequence of tension in the fiber axis whereby the crystallographic direction of the greatest rapidity of growth lies in the fiber axis. The cementing substances are more readily attacked than the crystallites, since hydrocellulose in spite of profound mechanical breakdown shows the same diagram as normal cellulose.

Chemistry and physics of the wool fibre, F. A. HAYES (*Textile World, 68 (1925), No. 19, pp. 63, 65*).—A popular account of the chemical and physical properties of wool.

Revised report on rayon specifications (*Textile World, 69 (1926), No. 14, pp. 65, 66*).—This is the revised report on proposed specifications and test methods for rayon submitted by Subcommittee XV of Committee D–13 of the American Society for Testing Materials.

Report on oiling of cotton, R. T. FISHER (*Amer. Wool and Cotton Rptr., 40 (1926), No. 16, pp. 37, 39, 41*).—The effect and benefits of adding a small amount of oil to the raw cotton in the hopper of the breaker picker were studied by running regular and oiled stock at the same time in adjacent machines.

No visible change in the running qualities of the oiled cotton was seen in the pickers, and the percentage of waste removed by the beaters was substantially unchanged. While slightly less fly appeared in the air around the cards running on oiled cotton, the difference in actual waste was negligible. A visible improvement was observed in the running of the oiled cotton in the drawing, in the roving process, and in the spinning. Under the test conditions the average yarn strength of the oiled cotton and the variation of the individual breaks from the average were less than for the regular cotton. The advantages seen in these and other tests did not seem sufficient to justify the adoption of the process in the mill where the tests were made.

Selection of cotton fabrics, R. O'BRIEN (*U. S. Dept. Agr., Farmers' Bul. 1449 (1926), pp. II+22, figs. 26*).—Popular information is given concerning the construction of cotton fabrics, weaves, finishing, and dyes, and the appropriate uses of fabrics. A brief glossary of common cotton fabrics is appended.

The story of cloth (*Rochester, N. Y.: Hickey-Freeman Co., 1925, pp. 37, pl. 1, figs. 19*).—This handbook, written primarily for salesmen of men's clothing, contains general facts about wool, the essential differences between woolen and worsted yarns and fabrics, typical woolen and worsted suitings, overcoatings, and other fabrics. Samples are included of the fabrics discussed.

Dictionary of furs, G. W. PAULI (*Davenport, Iowa: Pow-Lee Jeffries Co., 1925, pp. 52*).—This booklet defines the numerous kinds of furs and gives popular information concerning their sizes, qualities, costs, and utilization.

The costumes of eastern Europe, M. TILKE (*New York: E. Weyhe, 1925, pp. [5]+32, pls. 96, figs. 12*).—The history of costume design in eastern Europe is presented in 96 color plates representing typical costumes of different periods in Greece, Albania, Bosnia, Turkey, Macedonia, Bulgaria, Serbia, Herzegovina, Dalmatia, Hungary, Moravia, Poland, Rumania, Wallachia, Podolia, various sections of Russia, Esthonia, Livonia, Finland, and Lapland. The designs are for the most part drawn on a scale of 1 to 10 from original costumes in various museums, and in some cases are further illustrated by small drawn

figures all accurately reproduced in color. In the description of the plates attention is called to the relationship of the various patterns of the garments which distinguish individual types and show historical development.

The folk costume book, F. H. Haire (*New York: A. S. Barnes & Co., 1926, pp. IX+150, pls. 20*).—Descriptions, accompanied in most cases by colored plates by G. Moser, are given of selected folk costumes representing the usual holiday attire of various European countries and of a few United States period costumes. In the descriptions of the costumes suggestions are given for inexpensive materials to be used in the development of the costumes for pageants, theatricals, and folk dances.

A short description of historic fashion, B. Northrup and A. L. Green (*New York: Teachers Col., Columbia Univ., 1925, pp. 7, pls. 30*).—This is a loose-leaf folio of 30 plates, 14 of which illustrate typical costumes from Egyptian and medieval times to the twentieth century and the remaining ones national or peasant dress of the East and West. Each plate contains in addition small sketches of details and descriptive notes on color, materials, and decoration. An accompanying pamphlet by the senior author gives a short description of historic fashion, with an index and suggestions for using the illustrative material in designing modern and theatrical costumes.

HOME MANAGEMENT AND EQUIPMENT

***A method for testing gas appliances to determine their safety from* producing carbon monoxide,** E. R. Weaver, J. H. Eiseman, and G. B. Shawn (*U. S. Dept. Com., Bur. Standards Technol. Paper 304 (1926), pp. 125–154, figs. 25*).—The causes which result in the liberation of carbon monoxide from gas appliances are briefly discussed, together with the character of the tests which must be applied to determine the relative safety of different appliances in use.

The results of tests upon numerous appliances are given in graphic form, both to illustrate the application and value of the testing methods, to show the range of hazard in existing appliances, and to indicate what may reasonably be expected of a good appliance in service. It is shown that all types of appliances commonly used, such as ranges, water heaters, radiant room heaters, etc., can readily be made safe from the carbon monoxide hazard, but that there is no certain way except by a laboratory test by which even an experienced person may judge whether or not an appliance is operating safely.

In tests of nine radiant heaters no feature of construction could be isolated which served to distinguish the safe appliances from the unsafe ones. Their character could not be recognized by the appearance of the flame or by any other characteristic except the actual composition of the products of combustion. Five of the appliances completely burned the gas supplied to them and four did not. All four of the radiant heaters that produced carbon monoxide under normal operation introduced more primary air than the heater which could not be made to produce carbon monoxide even under forced tests.

The opinion is expressed that because appliances are not always connected to flues, and because the draft in a chimney is not always positive, heaters should not be dependent upon the action of the flue to give complete combustion.

Domestic heating, M. Fishenden (*Jour. Roy. Soc. Arts, 74 (1926), No. 3828, pp. 452–469*).—A detailed discussion is presented of some of the technical features of proper domestic heating from the British viewpoint. It is pointed out that for continuous heating in small rooms air heating is generally the cheapest method, but as the size of the room increases open coal or coke fires become cheaper, especially if there are only a few people present. For very

large rooms, open fires alone become impracticable and some form of air heating must generally be used.

The absorption refrigerating machine: Advanced practice and theory, G. T. Voorhees (*Chicago: Nickerson & Collins Co., 1924, pp. 165 [pls. 21], figs. [6]*).—This is a complete technical treatise on absorption refrigerating systems which contains not only the fundamental principles but also detailed data for the design and construction of the absorption machine for all working conditions.

A photometric method for measuring the hiding power of paints, H. D. Bruce (*U. S. Dept. Com., Bur. Standards Technol. Paper 306 (1926), pp. 173–190, pls. 2, figs. 6*).—The results of an investigation to develop a method for measuring the hiding power of paints from dry films are reported. A photometric method was evolved in which the contrast is measured between the two shades of a black and white plate showing through a thin overlying coating of paint. The degree of this contrast is a function of the film thickness and the hiding power of the paint. The hiding thickness is computed from the formula

$$x=7a\sqrt{\frac{1}{b}-1},$$

in which x is the hiding thickness, a is the measured film thickness, and b is the measured contrast ratio. The hiding power in square feet per gallon is then calculated from the formula, hiding power $=\frac{0.4075\ (100-\text{per cent of volatile})}{\text{hiding thickness in mm.}}$

MISCELLANEOUS

Thirty-seventh Annual Report [of Arkansas Station], 1925, D. T. Gray (*Arkansas Sta. Bul. 203 (1926), pp. 54, figs. 15*).—This contains the organization list, brief summaries of the chief lines of work of the station, and a financial statement for the fiscal year ended June 30, 1925. The experimental work recorded is for the most part abstracted elsewhere in this issue.

Report of the director [of Connecticut Storrs Station], 1925, W. L. Slate, jr. (*Connecticut Storrs Sta. Bul. 136 (1925), pp. 429–444, figs. 8*).—This contains the organization list, a report of the director, and a financial statement for the fiscal year ended June 30, 1925. The experimental work reported is for the most part abstracted elsewhere in this issue.

Thirty-eighth Annual Report of [Indiana Station], 1925, G. I. Christie and H. J. Reed (*Indiana Sta. Rpt. 1925, pp. 64, figs. 27*).—This contains the organization list, a report of the director summarizing the activities of the station, publications of the year, changes in staff, the text of the Purnell Act and of State legislation accepting the act and establishing a station department of agricultural statistics, etc., and a financial statement for the Federal funds for the fiscal year ended June 30, 1925, and for the remaining funds for the fiscal year ended September 30, 1925. The experimental work reported is for the most part abstracted elsewhere in this issue.

Forty-fifth Annual Report of the New Jersey State Agricultural Experiment Station and the Thirty-seventh Annual Report of the New Jersey Agriculural College Experiment Station for the year ending June 30, 1924, J. G. Lipman et al. (*New Jersey Stas. Rpt. 1924, pp. XXIX+421, pls. 7, figs. 21*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1924, a report of the director on the work and publications of the year, and departmental reports, the experimental features of which, not previously reported, are for the most part abstracted elsewhere in this issue.

Thirty-seventh Annual Report [of Texas Station], 1924, B. Youngblood (*Texas Sta. Rpt. 1924, pp. 30*).—This contains the organization list, a report of the director on the work and publications of the station, including an account of loin disease of cattle previously noted (E. S. R., 52, p. 83), and a financial statement for the Federal funds for the fiscal year ended June 30, 1924, and for various State funds for the fiscal year ended August 31, 1924.

The Quarterly Bulletin [of the Michigan Station], edited by R. S. Shaw and E. B. Hill (*Michigan Sta. Quart. Bul., 8 (1926), No. 3, pp. 97–158, figs. 14*).—In addition to articles abstracted elsewhere in this issue, this number contains the following: Seed Corn Should Be Tested Carefully, by J. F. Cox; Certified Potato Seed, by H. C. Moore; Land Utilization in Southern Michigan, by M. M. McCool and F. W. Trull; Fertilization and Quality of Muck Crops, by P. M. Harmer and A. G. Weidemann; and Obituary—Professor Leslie H. Cooledge, by F. W. Fabian.

Bimonthly Bulletin of the Ohio Agricultural Experiment Station, [March–April, 1926] (*Ohio Sta. Bimo. Bul., 11 (1926), No. 2, pp. 41–88, figs. 11*).—This number contains, in addition to several articles abstracted elsewhere in this issue, the following: Prof. H. A. Gossard; Emmer Not Adapted to Ohio; Bacillary White Diarrhea of Chicks; The Sweet Pea: Planting, Culture, and Varieties, by C. W. Ellenwood; The Hog Situation, by J. I. Falconer; and State Purchases Additional Forests.

NOTES

Florida Station.—Dr. R. V. Allison, for the past two years chemist and soil biologist for the Tropical Research Foundation in Cuba, has been appointed soils specialist of the Everglades Substation, effective September 1. The soil problems of the millions of acres in the Everglades are of unusual importance and complexity, and their solution is deemed quite essential to the fullest development of crop production.

The department of grass and forage crops investigations has been enlarged into a department of agronomy. The plans call for a considerable expansion of the work in the near future.

Georgia Station.—R. C. Campbell has been appointed, beginning July 1, assistant agronomist for special studies of the quality of cotton fiber.

Illinois University.—A two-story poultry building has been erected on the 35-acre poultry farm. It is of frame construction, 24 by 60 ft., with concrete foundations and basement. The basement contains an incubator cellar, a candling room, and space for egg storage, while on the first floor there is a large judging room, in which from 40 to 50 birds in single coops may be handled at one time by classes.

Kansas College.—The corner stone of the new library building was laid at the recent commencement.

Maine Station.—*Science* states that Dr. John W. Gowen, biologist, has resigned to accept a position with the Rockefeller Institute for Medical Research, with headquarters at Princeton, N. J.

F. V. Owen, who recently completed his graduate work in agronomy and genetics at the University of Wisconsin, has been appointed associate biologist, and is stationed for the summer at the Aroostook Farm where he is in charge of the plant breeding operations

Massachusetts College.—The most successful farm and home week in the history of the college closed July 30, with an estimated attendance of between 5,000 and 6,000 visitors.

Minnesota University and Station.—According to the *Gopher Countryman*, Walter F. Hoffman, assistant professor of biochemistry and assistant chemist, has resigned to engage in commercial work and has been succeeded by W. R. Sinclair of the University of California. Edwin W. Gaumnitz has resigned as assistant professor of agricultural economics and assistant agricultural economist to accept an appointment with the extension service of the Iowa College.

Dr. Clarence A. Morrow, assistant professor of agricultural biochemistry since 1917, died July 1 at the age of 45 years. He was a graduate of Ohio Wesleyan University in 1906, receiving the M. A. degree from Oberlin College in 1909 and the Ph. D. degree from the University of Minnesota in 1918, and had been head of the chemistry departments of Doane College and Nebraska Wesleyan University. He was the author of Biochemical Research Methods for Students of the Biological Sciences, published in 1925.

Missouri University and Station.—Beginning September 1, the university department of rural life is to be divided into a department of rural sociology under the chairmanship of E. L. Morgan and a department of agricultural economics under the chairmanship of O. R. Johnson.

The resignations are noted of Elmer E. Vanatta, assistant professor of agricultural chemistry and assistant chemist, and R. William Scanlan, assistant in soils, effective August 31 and July 31, respectively. Effective September 1, Eugene W. Cowan has been appointed instructor in agricultural chemistry and Franklin L. Davis assistant in soils.

Montana College.—M. L. Wilson, senior agricultural economist in charge of the Division of Farm Management and Costs, Bureau of Agricultural Economics, U. S. D. A., resigned July 19 to return to the department of agricultural economics, from which he was granted leave of absence in 1924.

Cornell University.—The department of education of the College of Arts and Sciences and the department of rural education of the College of Agriculture have become affiliated as a university division of education.

New York State Station.—The resignation, effective July 1, is noted of Orrin M. Taylor, for 26 years assistant and associate in the horticultural department. Alwin Berger, Ph. D., assistant in research, has been appointed associate in research (horticulture). Other appointments effective July 1 include P. V. Traphagen, Paul S. Prickett, and L. M. van Alstyne as assistants in research in agronomy, bacteriology, and horticulture, respectively.

Ohio Station.—Former Director Charles E. Thorne, at present consulting chief in agronomy, was given the degree of doctor of science by the College of Wooster at its recent commencement.

Porto Rico College.—Dr. Frank D. Kern, dean during the past year, has returned to his former position as head of the department of botany at the Pennsylvania College.

Texas Station.—Dr. B. Youngblood has been granted leave of absence to accept an appointment, beginning July 1, with the Bureau of Agricultural Economics, U. S. D. A., as senior agricultural economist for the purpose of studying cotton marketing problems. Vice Director A. B. Conner has been appointed acting director, and Assistant Director R. E. Karper has been made vice director.

Dr. Jessie Whitacre has been appointed head of the division of rural home research.

Virginia Truck Station.—Harold S. Peters has been appointed assistant entomologist, effective June 18, vice H. J. Henderson, resigned.

Wisconsin Station.—A grant from the State Manufacturers Association of $10,000 per year for five years has been accepted for a study of contagious abortion in cattle.

Agricultural Education for Women in Belgium.—According to a recent account in the *Journal of the Ministry of Agriculture of Great Britain*, agricultural education for women in Belgium began in 1888, and at present three types of institutions exist, namely, (1) those of training-college standing with 3-year courses, of which there are four, (2) those having 2-year courses of residential trade school standing, of which there are 25, and (3) post-scholastic courses and itinerant schools, there being 34 of the former and 18 of the latter.

Of the institutions having 3-year courses, the Institute of Laeken was founded by the Government to train teachers for all branches of house and farm management and to effect a technical education capable of raising the standards of country life and giving farm women sound ideas about rural and domestic economy. Students must be 17 years of age, have a secondary school education, and be physically fit for domestic and agricultural work. The course consists of 2 years, covering all branches of domestic work, agriculture with special reference to branches of interest to women, rural law, etc., and the principles of teaching, followed by a year of special work either

in agriculture or practical teaching. The practical work is divided into five sections, and each group of pupils changes its work weekly. Pupils are taught to use ordinary equipment and also modern equipment and improved methods. The Berlaer School in general resembles the Laeken School, except that it concentrates on the training of the prospective teacher in the elementary school. The Wavre-Notre-Dame Convent School, besides its training colleges for elementary and secondary teachers, has a training college for teachers of household and farm management consisting of 2 years of science, practical agriculture, and domestic science, and 6 months' practice in teaching.

The middle level schools aim to instruct girls of 14 years and upwards in all housewifely and agricultural duties of the farm. The instruction covers 1 or 2 years and is both theoretical and practical, the latter being required by the regulations of the Ministry of Agriculture. The scheme of training in the main follows that of the Institute of Laeken.

The lower level instruction is given by (1) itinerant schools which are set up in the villages and give 4-month intensive courses to from 15 to 25 scholars, (2) caravan schools consisting of four caravans, which, when joined together, afford a classroom, dairy, kitchen, offices, etc., all completely equipped and lighted, (3) women advisers, and (4) postschool courses of 200 hours of instruction during 2 years for girls of 14 who have left the elementary schools.

Agricultural Education in Burma.—An agricultural college was formally opened in December, 1924. Twenty-four students had begun the proposed 4-year course in July, 1924, but examinations during the year resulted in the withdrawal of the Government stipends of 11 of these students and showed that if affiliation was to be made with the university it was necessary to have higher entrance requirements. In March, 1925, the Government approved changing the course from 4 to 3 years, but inability to get students has resulted in a temporary abandonment of affiliation with the university, the reinstatement of high school final requirements for entrance, and the substitution of a 3-year diploma course for the 3-year degree course.

During the year the Government granted Rs. 11,200 recurring and Rs. 10,375 nonrecurring subsidy to the Pyinmana Agricultural School of the American Baptist Mission, which opened in May for the third year with 62 students.

Short training courses for cultivators were attended by 131 persons. The Government as an experimental measure has sanctioned the establishment of farm schools at the Hmawbi and the Mahlaing Central Farms. These schools are to be in charge of a senior agricultural assistant and will give short courses not exceeding one year to practical cultivators who are likely to return to their land to act as honorary helpers and organizers for the department.

New Journals.—*Eos*, a Spanish journal of entomology, is being published quarterly by the National Museum of Natural Sciences at Madrid. The initial number contains original articles entitled The Genus Aphycus and Its Allies, by R. M. Mercet; The Genus Hiethera Uv. and Its Species, by B. P. Uvarov; The Spanish Obisium of the Subgenus Blothrus, by J. F. Nonidez; A New Xantholinus from Spain, by O. Scheerpeltz; and Eumastácidos from New Guinea, by C. Bolívar y Pieltain.

Bulletin of the Chemical Society of Japan is being published monthly in English, French, or German through the cooperation of the Faculty of Science, Imperial University of Tokyo. Among the five original articles in the initial number is one by K. Shibata entitled The Anhydration of Amino Acids and Peptids.

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EXPERIMENT STATION RECORD

Vol. 55 August, 1926 No. 2

Amply fulfilling most of the expectations which had been entertained for it, the International Congress of Plant Sciences, held at Cornell University during the week of August 16, was a gathering of much interest and importance from several points of view. It brought together for the first time on American soil a goodly company of the world's workers in the plant sciences and afforded exceptional opportunities for personal contacts and acquaintanceships. Its program was planned to include a wide range of subject matter and proved to be of substantial appeal. Its sessions were well reported in the daily press, and directed popular attention not only to the progress and attainments of research in the botanical and allied sciences but also to the practical relations of biological research in the world's affairs as no body less broadly constituted in membership and scope could have hoped to do.

Historically speaking, the congress was distinctly an interim meeting. It took the place of the Fourth International Botanical Congress, originally scheduled to meet in London in 1915, and was thus the first international gathering of even approximately similar makeup since the Third Congress at Brussels in 1910. Following the waiving of any priority of claim on the part of British botanists for the honor of the first meeting since the outbreak of the World War, it was organized under the auspices and with the cooperation of the American research societies in the plant sciences, with a view to bringing together a widely representative gathering of leaders for the presentation and consideration of fundamental contributions to the research and educational aspects of the plant sciences. As was pointed out in the preliminary announcement of the congress, various important and in many cases epoch-making advances had been made in numerous phases of the field. "Also, the interval of 16 years since the last congress has witnessed the development of a new generation of productive plant scientists who have had little or no opportunity for wide personal contact. It is generally agreed that the situation calls for a thorough integration through a

representative international gathering which will take stock of the status of the varied aspects of plant science, establish or reestablish contacts among investigators and educators, and generally prepare the way for the rapid coordinated and sympathic advance of the plant sciences."

Although the congress was thus closely related to the series of botanical congresses, it was not regarded as their full successor and differed from them in two important particulars. Its scope was widened to include specifically what were termed the broader applications of botany in the fields of bacteriology, agriculture, and forestry, but this was done independently of policies for future congresses, which are therefore not committed in this respect in any way. Also, while a special invitation was extended to investigators and teachers, membership was unrestricted, and largely in view of this fact the policy was adopted of providing opportunity for the discussion without formal action of such subjects as nomenclature, international quarantines, and similar matters. Considerable interchange of views resulted under this plan, and the path was doubtless cleared perceptibly in numerous directions for definite action by subsequent congresses.

The registration for the congress exceeded 900, of whom over 100 came from some 25 foreign countries. Most of the European nations were represented, as well as a considerable group from Canada and one or more delegates from Mexico, Cuba, Ecuador, China, Japan, India, Australia, New Zealand, and the Union of South Africa. A group of honorary chairmen of the congress was selected from abroad, as well as the chairmen of the various sections so far as possible, and in many other ways every effort was exerted to secure an active participation in the congress by the visitors.

The attendance from the United States was drawn mainly from a large number of educational and research institutions. Several of the bureaus and offices of the U. S. Department of Agriculture were represented, and there were about 100 registrants from the agricultural colleges and experiment stations. These workers came from about 30 States in addition to Hawaii, Porto Rico, and the Philippines, the territory east of and adjoining the Mississippi River being quite completely represented. Departments of botany naturally were most largely in evidence, but there were numerous geneticists, agronomists, horticulturists, foresters, and zoologists and a quartette of station directors.

Local arrangements for the congress were entrusted largely to committees from the Cornell University staff, and there was widespread commendation for the adequate and thoroughgoing way in which, despite the handicap of most discouraging weather conditions,

these committees discharged their respective functions. Ample accommodations were available on the university campus for all in attendance, this feature not only saving much time but contributing greatly to the promotion of acquaintanceship. Exceptional opportunity was afforded through the numerous excursions and in other ways for visitors to familiarize themselves with the flora of the region and the work and equipment of the university and the experiment station, as well as the numerous exhibits which had been arranged. The week closed with a one-day trip to the New York State Experiment Station at Geneva, and was followed by longer excursions for those interested to the fruit belt of New York and to eastern Canada and a western field trip from August 23 to September 15.

Mention should also be made of two meetings arranged in cooperation with the congress which added to its value. One of these was the nineteenth annual meeting of the Association of Official Seed Analysts of North America, which held sessions at the university simultaneously with the congress and in affiliation with it. The other was an International Conference on Flower and Fruit Sterility under the auspices of the Horticultural Society of New York. This conference met in New York City from August 12 to 14, spending one day at Columbia University and the New York Botanical Garden and one day each at the Boyce Thompson Institute for Plant Research at Yonkers and the Brooklyn Botanic Garden. Its program included over 50 papers pertaining to phenomena of sterility in fruit and in seed production, with special reference to difficulties in the breeding of plants, problems of fruit and seed production in a wide range of horticultural and agricultural crops, and the botanical and genetical aspects of sterility and fertility. The conference brought together an unusual number of the leading horticulturists, botanists, plant breeders, and geneticists, including a large proportion from the experiment stations, and preceding as it did the meeting of the congress supplemented materially the opportunities afforded by that body for a full interchange of views on a subject so restricted in scope as to permit of detailed consideration.

The congress was formally opened at a general session presided over by its president, Dr. L. H. Bailey, formerly dean of the New York State College of Agriculture and the 1926 president of the American Association for the Advancement of Science. A felicitously worded address of welcome by President Farrand of Cornell University, the reading of a letter from Secretary of Agriculture Jardine expressing his regret at his inability to be present and his deep interest in the congress, and on behalf of those in attendance from abroad a message of greeting and good will by Dr. A. B.

Rendle, delegate from the British Association for the Advancement of Science and other institutions, completed the session, and the evening was closed with an informal reception.

The remainder of the week was largely occupied with sectional and group programs, round table conferences, the excursions to nearby points of interest, and other special features of entertainment. An evening address open to the public was given by Dr. F. A. F. C. Went of Utrecht, Netherlands, on the subject of Plant Movement, and another by Dr. Erwin F. Smith of the U. S. Department of Agriculture on the topic of Fifty Years of Phytopathology. In his address Dr. Smith reviewed quite fully the progress which had been made during the half century in combating diseases of plants, animals, and mankind, and indicated some of the more striking scientific achievements of the period.

Because of the interim nature of the congress but little business was brought forward, and two brief midday sessions were substituted for a final meeting originally scheduled for the ensuing week, thereby advancing by three days the date of adjournment. An invitation from British botanists to hold the next congress in London was unanimously accepted, and authority was given for the appointment of continuation committees by any sections desiring this privilege as a means of carrying on their work during the interval and making report at London. These committees, however, it was made plain, were in no sense to represent the congress as a whole, and were not to interfere in any way with the complete freedom of action of the British botanists upon whom the organization of the next congress will devolve.

One other matter of general interest was acted upon. This was the unanimous adoption of a resolution declaring as the sense of the congress that "the proper maintenance, increase, accessibility, and utilization of the great herbaria of the world are matters of international concern, not merely to botanical science but to the nations which profit through the contributions therefrom to the advancement of civilization."

The congress was subdivided into 13 sections, and it was before these that the bulk of its more than 200 papers were presented. With the exception of two groups, one of which dealt with morphology, histology, and paleobotany, and the other with pharmacognosy and pharmaceutical botany, each of the sections was devoted to a single subject covering, respectively, agronomy, bacteriology, cytology, ecology, forestry, genetics, horticulture, physiology, pathology, taxonomy, and mycology.

Most of these sections held simultaneous sessions on four successive mornings for the reading and discussion of invitation papers, while the afternoons were, as a rule, left open for round tables, excursions,

or additional discussions. Under the circumstances a certain amount of overlapping of subject matter by the different sections was inevitable, and the problem of selection between numerous papers of interest was frequently embarrassing to would-be hearers. The program as a whole, however, showed evidences of careful study and correlation, and the conflicts for most people were less serious than might have been anticipated. In many cases joint meetings were scheduled to provide for such a contingency. This arrangement proved very beneficial, not only economizing in time but bringing together new groups and materially broadening the viewpoint and perspective. Thus the round table discussion in the agronomy section on the place of statistics in the interpretation of experimental data was shared by the sections for genetics, horticulture, and physiology. The cytology section held two joint sessions with that of genetics and a round table discussion with the section for physiology. The section on ecology met jointly with that of forestry and later with those of physiology, horticulture, and agronomy and discussed with the horticulturists and physiologists the subject of photoperiodism.

From as few as 7 to as many as 30 papers were scheduled in the different sections, and their disparity in numbers as well as in length resulted in some marked differences as regards fullness of program. In some cases the congestion was so considerable as to suggest the wisdom of providing and enforcing a time limitation, while in others an ample opportunity for discussion contributed greatly to the value of the meetings. Although the papers solicited from foreign countries constituted about half of the projected program, many of these were not forthcoming, hut a sufficient number were presented to give a true international flavor to the proceedings and differentiated them quite perceptibly from the meetings of similar groups in bodies like the American Association. An effort was made to obtain in advance summaries of the various papers, and mimeographed abstracts of such as were obtainable proved of great convenience.

The traditional distinction between "pure" and "applied" science, which Dr. Bailey insisted should be supplanted by a distinction between the fundamental and the temporary, was little in evidence at the congress. Some of the papers naturally related to agriculture more directly than others, but there were few sessions without more or less appeal from this standpoint.

The section of agronomy presented several papers from abroad, among which may be mentioned one entitled Nature and Agriculture in Dry Regions of the U. S. S. R., by Dr. N. M. Tulaikov of the Saratov Experiment Station, in which the contributions of

science to the reclamation and utilization of semiarid regions were reviewed in considerable detail. The round-table discussion on the place of statistics in the interpretation of experimental data which has already been referred to served to bring out quite clearly the opinion that statistical methods can not arbitrarily supersede the conclusions suggested by common sense, but that when properly employed they may serve as a very valuable aid in the interpretation of experimental findings. A supplementary paper by L. J. Stadler of the University of Missouri on experimental error in field trials discussed some of the limitations and possibilities of this means of experimentation. The joint session with the section of genetics took up largely the question of breeding disease-resistant cereals, with an additional paper on dependent segregation.

The horticultural section presented a full program quite largely contributed by station workers, with excellent atendance and numerous interesting discussions. A considerable range of subjects was covered, and the increasing tendency of horticulturists to call to their aid the resources of physiology, genetics, and other branches of biological science was indicated by the four joint sessions in which the section participated. Of these special mention may be made of the round-table discussion with the physiologists and ecologists on the topic of interrelation between photoperiod temperature and nutrition and its influence on plant behavior, with especial reference to flowering v. vegetation.

The section of pathology organized its comprehensive program into an opening session dealing with general pathology, teaching, and similar questions, an afternoon's discussion of proposals submitted looking toward a coordination of research on virus diseases of the potato, the nomenclature of plant pathogenes, and an international league for the development of immunity in plants, and three full-day sessions devoted, respectively, to the topics of filterable virus diseases, yellows, mosaic and related diseases, parasitism, and biological considerations of the international movement of plants and plant products. On some of these topics the interchange of views revealed some contrasting opinions, but seemed likely to result in a better understanding of viewpoints and ultimate general advantage. Special mention may also be made of an event not included in the formal program of the congress but of interest to plant pathologists and others. This was a dinner given in honor of Dr. L. R. Jones of the Wisconsin University and Station by his former students, at which a portrait of Dr. Jones was presented to that university.

Discussion of questions of nomenclature occupied much of the attention of the sections of taxonomy and mycology, and to some extent bacteriology, and resulted in considerable exchange of views

if not in definite action. A session of the bacteriologists dealing with variability in bacteria attracted special notice, the impression being conveyed that even such specific lines as have been drawn among these forms may not be warranted in the light of additional investigation.

One of the striking features of the congress was the large amount of attention given to the fundamentals of plant life. The similarity between the titles of the papers offered in the sections of cytology and genetics and their numerous joint meetings and demonstrations emphasized the dependence of genetics on cytology in testing theories of methods of inheritance and for offering further explanations for various hereditary phenomena.

Considerable interest irrespective of sectional lines was shown in a symposium on the nature of the gene. In an opening paper on the concept of the gene, the possible variability of its size and stability was considered analogous to the chemical atom in which changes may occur. It was pointed out that our present superficial knowledge of genes is largely based on crossover frequencies and that much is still to be learned. A number of other papers indicated a tendency toward modifying, to some extent, the older idea that the chromosomes and genes are very stable and exact in their behavior. Hybridization appeared to be an important cause of irregular chromosome behavior, while such irregularities were suggested as one cause of sterility.

Although a primary object of the congress was to foster research in the plant sciences, the great bulk of the papers presented were in the nature of reports of specific investigations rather than discussions of research itself and the ways in which it should be developed and stimulated. In the section of forestry, however, considerable attention was devoted to problems of organization and methods. Thus Prof. A. Rodger of India described the work under way since 1906 in the conservation and improvement of Indian forests through a research system of which the principal center is the Forest Research Institute at Dehra Dun, for which buildings are now being constructed and equipped at an estimated cost of £825,000 and which will make it the largest and most complete establishment of its kind in the world. The developments in Canada, Finland, and Italy were described by other speakers, and at a round-table discussion considerable interest was manifested in a proposal to reorganize the International Association of Forest Experiment Stations, dormant since the outbreak of the World War.

Of particular interest for readers of the *Record*, however, was a paper entitled The Problems of Forest Experiment Station De-

velopment, by Mr. E. N. Munns of the Forest Service of the U. S. Department of Agriculture. This paper reviewed the growth of the forest experiment station system in this country, pointed out the need and opportunities for research in forestry, and emphasized the dependence of such research upon the application of sound principles and especially the training of broadly equipped investigators imbued with the research spirit. The experience which has accumulated in the field of agricultural experimentation was freely drawn upon, and the inference was quite evident that forestry is passing through much the same evolution, an era of exploitation, a period of reliance upon such information as tradition and rule of thumb could impart, a more or less successful attempt to transplant or engraft in this country the results of such experimentation as had been carried on in Europe, and eventually a realization that a comprehensive and thoroughgoing system of American research institutions, permanently organized and broadly developed, was essential to progress, which has culminated in the series of regional forest experiment stations now well under way. Several speakers made it clear that these stations must be much more than local demonstration areas and must be adequately manned by a force thoroughly grounded in biological science as well as the technique of forestry. It was predicted that ultimately a scientific force of from 12 to 15 men would be needed in each of these stations, making them substantial additions to the research centers of the nation.

Although the congress as a whole may be said to have served rather as a convenient means of recapitulating results more or less fully reported elsewhere than as an occasion for the announcement of many new discoveries or the consideration of research policies and methods, it was probably as successful in these respects as most similar gatherings, and in other ways it performed some very useful functions. As a recent writer in *Science* puts it, the congress "formally typified the reestablishment of full cooperation among the botanists of all nations." Broadly interpreting the term botanists, this was apparently the chief object expected. Its attainment is of no little importance, giving the congress, as Dr. Bailey said, "its spiritual significance," and its influence will not soon be dissipated. Coupled with this, however, were the benefits inevitably accruing from what President Farrand termed "the mere contact and interplay of minds," the substantial merits of the program itself, and the satisfactions of the favorable environment and the unusually complete and convenient arrangements, making the congress as a whole an event of much value to science and a source of gratification and congratulation for all concerned.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Studies on gossypol: The gossypol and d-gossypol content of some North Carolina cottonseed meals, F. W. Sherwood (*Jour. Agr. Research* [*U. S.*] *32* (*1926*), *No. 8, pp. 793–800*).—To test the theory advanced by Withers and Carruth (E. S. R., 39, p. 886) that the lower toxicity of cottonseed meal as compared with cotton seed is due to the conversion of the gossypol in the original cotton seed to the less toxic substance *d*-gossypol, the author has determined the amount of gossypol and *d*-gossypol in 20 samples of North Carolina cottonseed meals manufactured under known conditions. The data thus secured have been supplemented by similar data on the same number of samples analyzed in 1918 by L. F. Williams and S. J. Marion. Of the 40 samples, 14 were made by the open-kettle, 22 by the continuous-cooker, and 4 by the cold press or expeller process.

In the continuous-cooker meals the content of gossypol varied from 0.007 to 0.228 per cent and of *d*-gossypol from 0.633 to 1.076 per cent. Corresponding figures for the expeller meals were from 0.02 to 0.102 per cent and 0.335 to 0.505 per cent, respectively, and for the open-kettle meals 0.021 to 0.150 and 0.544 to 0.963 per cent, respectively. A sample of raw kernels analyzed by the author contained 0.58 per cent of gossypol and 0.14 per cent of *d*-gossypol and one of raw meal in the series of Williams and Marion 0.559 and 0 per cent, respectively.

Although it was not possible to draw any conclusions concerning the relative destruction of gossypol in the different methods, the data are thought to confirm the theory of a conversion of the greater part of gossypol into *d*-gossypol in the manufacture of the meal. Under the conditions employed by Schwartze and Alsberg in their study of the toxicity of gossypol (E. S. R., 51, p. 880), only 5 of the 40 meals examined contained sufficient gossypol to cause injury to white rats in feeding experiments on a well-balanced diet containing not more than 50 per cent of cottonseed meal.

Some critical constants of furfural, W. V. Evans and M. B. Aylesworth (*Indus. and Engin. Chem., 18* (*1926*), *No. 1, pp. 24–27, figs. 2*).—Various constants of furfural have been reinvestigated on a specially purified sample and, in addition, the vapor pressure curve has been determined at from 40 to 170.6° C. or from a pressure of 8 to 966 mm. The constants are as follows: boiling point 161.7° at 760 mm., refractive index 1.52608 at the *D* line of sodium, critical solution temperature 120.9°, and critical solution concentration 50.7 per cent furfural.

The composition of yellow oil obtained in the manufacture of n-butyl alcohol by fermentation, C. S. Marvel and A. E. Broderick (*Jour. Amer. Chem. Soc., 47* (*1925*), *No. 12, pp. 3045–3051*).—"The high boiling material obtained as a by-product from the manufacture of *n*-butyl alcohol by fermentation has been found to be a complex mixture of *n*-butyl alcohol, active amyl alcohol, isoamyl alcohol, *n*-hexyl alcohol, and the *n*-butyric, caprylic, and capric esters of these alcohols. The acid *n*-amyl and *n*-hexyl esters of 3-nitrophthalic acid have been described."

Chemical investigation of the amylases and related enzymes, H. C. Sherman (*Carnegie Inst. Wash. Yearbook 24 (1924–25), pp. 306–308*).—This progress report deals chiefly with a new phase of the author's enzyme studies (E. S. R., 53, p. 408), namely, a study of the behavior of pancreatic amylase toward adsorbents and the use of adsorption as a step in the purification of enzymes.

In the experiments thus far carried out alumina gel has been used for the adsorption of pancreatic amylase from its alcohol-water solution and elution with disodium phosphate solution as the means of recovering the adsorbed enzyme. A relationship has been shown to exist between the reaction of the solution and the adsorption of the enzyme, but the optimum pH values for the adsorption have not yet been established. In the elution experiments solutions having values of pH 7 to 7.5 have proved most effective, suggesting that pancreatic amylase is an amphoteric colloid whose isoelectric point is in the neighborhood of pH 7, a concentration coinciding with that of optimum enzymic activity.

The preparation and properties of amylase from germinated wheat and rye, N. M. Naylor, M. Spencer, and M. House (*Jour. Amer. Chem. Soc., 47 (1925), No. 12, pp. 3037–3039*).—Amylases prepared from germinated wheat and rye by a method described by Sherman and Schlesinger for the preparation of malt enzyme in solid form were found to be similar to the malt enzyme in giving typical protein tests and showing optimum activity at a corresponding range of H-ion concentration in the starch substrate (pH 4.5 to 5.1 for wheat and 3.5 to 5 for rye amylase).

The dialyzability and adsorbability of insulin [trans. title], **E. Dingemanse** (*Biochem. Ztschr., 163 (1925), No. 4–6, pp. 412–421*).—Adsorption and dialysis experiments with insulin are reported and summarized as follows:

On dialysis or electrodialysis insulin passes through collodion membranes, but passes through parchment paper in traces only in acid solution. On electrodialysis insulin dissolved in hydrochloric acid migrates from the anode to the cathode in a manner similar to protein. The more impure the preparation the more it resembles protein in this respect. Insulin in acid solution containing about 0.06 mg. dry substance per unit is not adsorbed by kaolin. Solutions of greater impurity, 0.4 to 0.5 mg. dry substance per unit, are partially adsorbed by kaolin. On shaking a solution of insulin in sodium carbonate with kaolin, the greater part, 80 per cent, of the insulin can be recovered in the filtrate. Insulin in the form of a more or less purified pancreas extract can be adsorbed by carbons in acid as well as in neutral solution. Only small amounts of the insulin can be separated from the carbon by 80 per cent alcohol or a buffer solution of pH 8. Slightly more can be removed by glacial acetic acid.

The chemistry of drugs, N. Evers (*London: Ernest Benn, 1926, pp. VIII+9–247*).—This reference book is concerned chiefly with the chemical constitution and reaction of synthetic and natural drugs and the chemistry involved in their manufacture. Part 1 deals with synthetic hypnotics, antipyretics, local and general anesthetics, antiseptics, compounds of arsenic, antimony, and mercury, and miscellaneous synthetic drugs. In part 2 drugs of natural origin are considered in two sections dealing, respectively, with alkaloidal and non-alkaloidal drugs. The relationship between chemical constitution and physiological action is discussed briefly in an appendix, and another appendix contains lists of drugs, with official names, chemical names or constitution, and physiological action.

Principles and practice of agricultural analysis, H. W. Wiley (*Easton, Pa.: Chem. Pub. Co., 1926, 3. ed., rev. and enl., pp. XIV+685, figs. 98*).—This is the third revision of this well-known handbook (E. S. R., 18, p. 607).

The determination of phosphoric acid in small amounts [trans. title], K. SAMSON (*Biochem. Ztschr., 164 (1925), No. 4–6, pp. 288–294, fig. 1*).—A micro method of determining phosphoric acid in such substances as blood serum and cerebro-spinal fluid is described, with data on its accuracy.

The method consists essentially in removing the protein from the liquid by precipitation with trichloroacetic acid and centrifuging, precipitating the phosphorus with ammonium molybdate, nitric acid, and ammonium nitrate, centrifuging and washing this precipitate, dissolving it in excess of sodium hydroxide, and titrating the excess. Amounts of serum as small as 1 cc. or 0.5 cc., diluted to 1 cc. with distilled water, can be used for the determination.

An alternate extraction and exposure method used in connection with study of arsenicals, S. LOMANITZ, (*Jour. Agr. Research* [U. S.], *32 (1926), No. 5, pp. 499, 500*).—In this contribution from the New Jersey Experiment Stations, an alternate wetting and drying or extraction and exposure method for the analysis of arsenical mixtures is outlined, and data are presented indicating that the new method gives a closer approximation to conditions operative in field practice than the single extraction method commonly used. The method consists essentially in making successive determinations of water-soluble arsenic, first on the original material and then on the total residue after the extraction of the water-soluble material and exposure to the atmosphere in thin layers for varying lengths of time. The method is considered to be of value also in combination with the study of other factors such as varying degrees of atmospheric moisture, light and shade, and temperature.

The chromic acid method for estimation of small amounts of bromine, P. L. HIBBARD (*Indus. and Engin. Chem., 18 (1926), No. 1, pp. 57–60, fig. 1*).—A method for estimating bromine in amounts as small as from 0.1 to 10 mg. has been developed from the method of Baughman and Skinner (E. S. R., 43, p. 13). The procedure, which is especially adapted to the detection of bromine in organic matter, involves the preliminary removal of the organic matter by ignition, the removal of iodine with ferric sulfate (but not the subsequent removal of the iron), and the liberation of the bromine by chromic acid with a little free sulfuric acid. At this point the addition of hydrogen peroxide was found to be without advantage, but the presence of a small amount of chlorine was an aid to the complete liberation of the bromine. In solutions containing much chlorine, the double aspiration of Baughman and Skinner was found necessary.

The technique is given in detail, with a description and diagram of a simple apparatus for the determination, and data showing the accuracy of the method.

The chemical analysis of foods, H. E. COX (*London: J. & A. Churchill, 1926, pp. VII+323, figs. 38*).—This handbook on the examination of foodstuffs and the detection of adulterants, which has been written from the point of view of the British requirements of public health and the sale of food and drugs acts, contains selected methods, with references to the original literature, for the examination of foods, leavening agents, spices and condiments, and beverages. An appendix contains the public health regulations of 1925 concerning preservatives in foods.

The examination of spoiled canned foods.—I, Methods and diagnosis, J. R. ESTY and A. E. STEVENSON (*Jour. Infect. Diseases, 36 (1925), No. 5, pp. 486–500, figs. 2*).—This is a description of the routine methods employed at the research laboratory of the National Canners' Association, Washington, D. C., in the bacteriological examination of canned foods, with a discussion of the interpretation of the data in relation to the cause of spoilage.

Chemistry and analysis of the permitted coal-tar food dyes, J. A. Ambler, W. F. Clarke, O. L. Evenson, and H. Wales (*U. S. Dept. Agr. Bul. 1390* (*1926*), *pp. 40, figs. 4*).—Methods are given for the preparation of the 11 permitted coal-tar food colors listed in Miscellaneous Circular 52 (E. S. R., 54, p. 710), their physical and chemical properties are summarized, and the analytical data required in foundation and supplemental affidavits, the methods of analysis, and the purity specifications for each are tabulated. A list of 77 references to the literature is appended.

Moisture determinations in syrups and molasses, T. Markovits (*Planter and Sugar Manfr.*, *76* (*1926*), *No. 5, pp. 90, 91*).—In this critical discussion of various methods of determining total solids and moisture in sugarhouse products, comparative data obtained by the refractometer, the Official vacuum oven method at 70° C., and the distillation method of Bidwell and Sterling (E. S. R., 53, p. 805) are reported for 7 samples of Cuban blackstrap, 1 of unfiltered sirup, and 3 of refinery blackstrap. The highest figures for total solids were obtained with the refractometer and the lowest with the distillation method, the latter giving comparative results in only one case. It is suggested that decomposition of the constituents of the molasses takes place during the boiling with toluene in the distillation method and a certain extent in the other methods.

Investigation of the colloids of cane juices and syrups in Natal and Mauritius, R. G. W. Farnell (*Internatl. Sugar Jour.*, *27* (*1925*), *No. 317, pp. 254–260*).—This paper reports a comparison of sugarhouse products in Natal and Mauritius as to their content of various colloids determined by methods previously noted (E. S. R., 52, p. 412; 53, p. 207).

Hydrogen-ion concentration in cane-sugar factories, R. G. W. Farnell (*Internatl. Sugar Jour.*, *27* (*1925*), *No. 315, pp. 141–146, fig. 1*).—This is a more complete report of the investigation previously noted (E. S. R., 53, p. 612). Additional data are given on the H-ion concentration of sugarhouse products at different factories in Natal and Mauritius, with a discussion of their significance. A description, with diagram, is given of a quinhydrone electrode adapted for continuously recording the pH of a changing solution such as the clarified juice of a defecation factory. This electrode is recommended for sugarhouse work, with the caution that it can not be used for an alkalinity above pH 8 or in the presence of strong reducing agents such as sulfurous acid or sulfite.

Reports of the Association of Hawaiian Sugar Technologists (*Assoc. Hawaii. Sugar Technol. Rpts.*, *3* (*1924*), *pp. 241, figs. 27*).—This publication consists of the committee reports and papers presented at the third annual meeting of the Association of Hawaiian Sugar Technologists held at Honolulu, October 27–31, 1924. The papers of particular interest in this section are as follows: Notes on P_2O_5 and K_2O Determinations in Crusher Juice at Pioneer Mill Company, by J. H. Pratt (pp. 24–27); Clarification, by W. R. McAllep (pp. 27–32); Measurement of Turbidity in Juices, by W. E. Smith (pp. 32–34; Indicators (E. S. R., 53, p. 507), by H. A. Cook (pp. 34–42); Deterioration of Cane Mill Juices from the Aspect of Acidity Increase, by W. L. McCleery (pp. 52–56); Fine Straining of Raw Juice, D. G. Conklin (pp. 61–66); and Comparative Values of Normal Juice Factors, by R. Elliott (pp. 186–190).

Decolorizing carbons, A. A. Blowski and J. H. Bon (*Indus. and Engin. Chem.*, *18* (*1926*), *No. 1, pp. 32–42, figs. 11*).—The primary object of the investigation reported in this paper was to determine whether decolorizing carbons offer any practical advantage over bone char for the refining of sugar. A study was first made of the factors influencing the action of decolorizing carbons on sugar liquors such as time of contact of liquor and carbon, the tem-

perature, concentration, reaction, and quality of the color of the liquor and variations in the amount of carbon. From the data thus obtained, a test for rating carbons with regard to their decolorizing power analogous to the bone char efficiency test was developed, and a comparison was made of the properties of representative carbons and bone char.

Based on these comparisons, the advantages of the decolorizing carbon process over the bone char process are summarized as simplicity of process, reduced inversion losses, smaller investment necessary, and small wash water requirements. Balanced against these are the disadvantages of low nonsugar elimination, high losses in regeneration, and increased remelt boiling. In considering these points, two applications of decolorizing carbons are discussed—their use as a substitute for bone char and as an adjunct to the bone char process. The final conclusion drawn is that neither of these applications offers sufficient advantage over the bone char process at the present time to justify adoption in the refining of sugar on a large scale.

Bleaching of wood pulp, III, IV, C. E. Curran and P. K. Baird (*[Tech. Assoc. Pulp and Paper Indus.], Tech. Assoc. Papers, 8. ser., No. 1 (1925), pp. 95–100, figs. 5*).—In continuation of the studies previously noted (E. S. R., 53, p. 209), two papers are presented.

III. *The effect of temperature on the bleaching of sulphite pulp* (pp. 95–97).—The data reported relate to the effect of temperature upon the time of bleaching, the color of the bleached pulp, and the fiber loss or shrinkage resulting from the chemical effect of bleaching. The pulp used was an all-spruce sulfite pulp of the type known commercially as "semi-easy bleaching." Temperatures of 21, 35, 41, and 46° C. were maintained during the bleaching under constant conditions of a consistence of 5 per cent, a bleaching liquor equivalent to 12.3 per cent bleaching powder based on the oven-dry weight of the pulp, a standard bleach liquor alkalinity of 1.18 gm. $Ca(OH)_2$ per liter, and a relative alkalinity ratio of calcium hydroxide to available chlorine of 0.033.

The percentage consumption of the bleach during the reaction, which was taken as a measure of the rate of bleaching, proved to be a linear function of the logarithm of the time through which the bleaching continued. Color analyses at various times by the Hess-Ives tint photometer showed no differences in the color change at equivalent periods of time of bleaching at the different temperatures and but slight differences in the final color. Shrinkage was slightly greater at the higher temperatures.

IV. *Effect of consistence on bleaching of sulphite pulp (low density study)* (pp. 98–100).—In this study the range of consistence was from 1 to 7 per cent and of temperature from 21 to 46°, the other factors being kept constant. The final color was practically independent of either consistence or temperature within the range of study, but the rate of bleach consumption increased with increased consistence.

Industrial fermentations, P. W. Allen (*New York: Chem. Catalog Co., 1926, pp. 424, pls. 16, figs. 57*).—In the preface to this volume the author classifies and illustrates the advantages to industry of microorganisms as follows: "The accomplishment of desirable physical or chemical changes (as cheese ripening); the prevention of undesired changes (as canning); the achievement of certain results unattainable by any other method (as bread-making); and the accomplishment of certain effects or reactions more economically than by other means (alcohol manufacture)." Each chapter deals with a single manufacturing process or industry as to history and use of the product, processes of manufacture, and microbiology involved. The subjects discussed are industrial alcohol, leather and tanning, retting of hemp and flax, the

preparation and use of legume cultures, disinfectants and disinfection, wood preservation, fermentation in the textile industry, tobacco, silage, organic acid production, acetone, glycerin, sewage disposal, soy-bean sauce manufacture, bread making, corn products, food preservation processes, canning industry, cane and beet sugar, meat products, marine products, vinegar manufacture, bread yeast manufacture, tomato products, fruit juices and beverages, coffee and cocoa, drinking water, the egg industry, maple sugar and maple sirups, dairy products, and the microbiology of the soil. References to the literature are given at the end of each chapter.

Some investigations on the bottling of cider, B. T. P. Barker and O. Grove (*Univ. Bristol, Agr. and Hort. Research Sta., Ann. Rpt. 1924, pp. 70–91*).—The first point studied in this investigation of the optimum conditions for bottling cider was the changes, physical and chemical, taking place in ciders of different types after bottling at the same age. Eleven ciders of widely different character were bottled directly from the storage vessels after having stood for from 3½ to 5 months and were examined after 10 months. In all cases sufficient fermentation in the bottle had taken place to bring the cider into adequate sparkling condition. The loss in specific gravity was in most cases slight. Where it exceeded one point the quantity of gas present was in excess of the requirement. There was a reduction in acidity in all cases, varying greatly in amount with the individual cider.

A comparison of the effect of the type of storage vessel upon the quality of the cider showed that storage in wood results in decided and long-continued loss in specific gravity even if the casks are kept filled and tightly bunged, while storage in bottles or in larger gas-tight vessels prevents any marked gravity change in filtered ciders older than 3 or 4 months. Transfer of cider from large air-tight storage containers to bottles caused no serious changes, but transfer from wood containers generally resulted in bacterial trouble. The amount of sediment in bottled cider appeared to depend upon the age of the cider at the time of bottling, this varying with the individual ciders.

It is concluded that cider should be bottled at the time when active fermentation has been arrested and clearing accomplished by filtration or corresponding means, provided the residual nitrogen content is not so high as to cause excessive fermentation in the bottle. Should this be the case the cider should be stored in air-proof vessels until the excess fermentation is exhausted.

Honey vinegar, F. W. Fabian (*Michigan Sta. Circ. 85 (1926), pp. 13, fig. 1*).—Brief directions are given for the home manufacture of vinegar from honey. The proper concentration of the honey is considered of prime importance, and two formulas are given for the dilution of strained or extracted honey, with the addition of suitable salts.

Some notes on dehydration or evaporation, C. H. Beaumont (*So. Aust. Dept. Agr. Bul. 185 (1924), pp. 24, figs. 16*).—This is based largely on California Experiment Station Bulletins 322 (E. S. R., 43, p. 715) and 337 (E. S. R., 46, p. 509), and Oregon Station Circular 40 (E. S. R., 49, p. 388).

Blacks and pitches, H. M. Langton (*London: Ernest Benn, 1925, pp. XI+13–179, pls. 7, figs. [8]*).—The first 8 chapters of this monograph deal with the preparation and uses of carbonaceous black pigments, classified as natural and artificial graphite; fixed carbon black, including bone black, wood charcoal, and mineral black; and deposited carbon or soot blacks, including carbon black and lamp black. The following 9 chapters deal with the pitches and bituminous materials, including native and petroleum asphalts and asphaltites, coal tar pitch and allied pitches, miscellaneous pitches, and fatty acid pitches. Chapters on the weathering and aging of bituminous materials, bituminous fabrics, bituminous paints, varnishes, enamels, and japans, and bituminous

paving materials complete the volume. An appendix on carbon black produced from natural gas in 1923, by G. B. Richardson, one on properties of various grades of mexphalte, and one on imports, exports, and reexports of carbon blacks, pitch, and asphalt and bitumen in Great Britain for the years 1921–1923 and January to November, 1924, are included.

METEOROLOGY

Monthly Weather Review, [January–February, 1926] (*U. S. Mo. Weather Rev., 54 (1926), Nos. 1, pp. 37, pls. 11, figs. 11; 2, pp. 39–83, pls. 14, figs. 19*).—In addition to detailed summaries of meteorological and climatological data and weather conditions for January and February, 1926, and bibliographical information, notes, abstracts, and reviews, these numbers contain the following contributions:

No. 1.—Average Pressures for Oceanic Areas Computed from Daily Synoptic Charts (illus.), by T. R. Reed; The Winds of the Middle and Northern California Coast (illus.), by A. J. Henry; Rainfall at Honolulu in Relation to Barometric Pressure at Midway Island and Honolulu, by W. G. Ramsay; Ascensional Rate of Pilot Balloons from Observations at Pavlovsk, Russia (illus.), by P. Moltchanoff, abs. by W. C. Haines; The Wind Factor and the Air Mail Southward from Kansas City (illus.), by J. A. Riley; and The Correlation Between Sun-Spot Number and Tree Growth, by J. A. Harris (see below).

No. 2.—Papers on the Relation of the Atmosphere to Human Comfort (illus.), by C. Dorno; Sixteen Years of Snow-Surveying in the Central Sierra and Its Results, by J. E. Church, jr. (see p. 116); An Examination by Means of Schuster's Periodogram of Rainfall Data from Long Records in Typical Sections of the World (illus.), by D. Alter (see below); The Criteria of Reality in the Periodogram, by D. Alter; and Some Outstanding Tornadoes, by C. J. Root.

The correlation between sun-spot number and tree growth, J. A. Harris (*U. S. Mo. Weather Rev., 54 (1926), No. 1, pp. 13, 14*).—Coefficients of correlation "computed from the original sun-spot numbers, *s*, of Wolfer and the ring measurements, *r*, of Douglass by the formula

$$r_{sr}=[\Sigma(sr)/N-\bar{s}\ \bar{r})]/\sigma s\ \sigma r''$$

indicated that there is "a low positive correlation between sun-spot number and tree growth. The relationship is by no means so intimate as many writers imply."

Application of Schuster's periodogram to rainfall periods between two and a sixth and nine years, D. Alter (*Abs. in Bul. Amer. Met. Soc., 7 (1926), No. 2, pp. 22, 23*).—Using practically the same data as in studies previously noted (E. S. R., 52, p. 415), the author made these shorter period studies for the stated reason that "if periodicities really exist, the method should show them much more certainly within this range than it did for the previous one. This is found to be strikingly true of the Pacific coast of the United States, of northern Europe, and of the Punjab. Any periodicities which may exist in the eastern United States are either of small amplitude or else not effective over the entire area. . . .

"A very marked bias of the Schuster periodogram peaks toward harmonics of the sun spot period of 22.25 years is noted, especially in the constant periodicity solution, which of itself bore no connection to sun spots. This bias is more pronounced the higher the peaks considered. Agreement is practically perfect for the highest peaks. The author believes the following to be well established: (1) Periodicities or cycles of various lengths exist; (2) these are

related to the sun spot period; (3) the periodicities are different, though related, for different types of climate. The following points are neither established nor disproved: (1) Constant v. varying periodicities; (2) economic value of periodicities."

An examination by means of Schuster's periodogram of rainfall data from long records in typical sections of the world, D. Alter (*U. S. Mo. Weather Rev. 54 (1926), No. 2, pp 44–56, figs. 9*).—A brief summary of the studies reported in detail in this paper is noted above.

Sixteen years of snow-surveying in the central Sierra and its results, J. E. Church, jr. (*U. S. Mo. Weather Rev., 54 (1926), No. 2, pp. 43, 44*).—The results of 16 years' study of the relation of the winter snowfall in 6 drainage basins of this area to the spring-summer flow show that "out of 54 forecasts for the entire 6 basins, 29 forecasts were within 10 per cent of the actual run-off, while 14 were within 20 per cent. In the remaining 11 the maximum divergence between snow cover and run-off was only 30.4 per cent."

Climatological data for the United States by sections, [January–February, 1926] (*U. S. Dept. Agr., Weather Bur. Climat. Data, 13 (1926), Nos. 1, pp. [194], pls. 4, fig. 1; 2 pp. [195], pls. 4, fig. 1*).—These numbers contain brief summaries and detailed tabular statements of climatological data for each State for January and February, 1926.

Meteorological observations, 1923–24 (*Guam Sta. Rpt. 1924, p. 14*).—A monthly summary of observations at the station on temperature, precipitation, and wind for the year ended June 30, 1924, is given. The year was characterized by light rainfall from December to June, with resultant drought effects.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. Ostrander and J. Bower, jr. (*Massachusetts Sta. Met. Buls. 447–448 (1926), pp. 4 each*).—The usual summaries and discussions are given of observations at Amherst, Mass., during March and April, 1926.

Ohio weather for the year 1924 (*Ohio Sta. Bul. 392 (1926), pp. 87–99, figs. 3*).—The data for temperature, precipitation, and length of frost-free period at the experiment station at Wooster, the district experiment farms, and the State at large are summarized in tables and diagrams. It is stated that "the outstanding features of the weather in Ohio during the year 1924 were a persistent subnormal temperature, great variation in the daily mean temperatures in January, November, and December, and the remarkable shortage of rain in October and early November."

SOILS—FERTILIZERS

The muck soils of Michigan, M. M. McCool and P. M. Harmer (*Michigan Sta. Spec. Bul. 136 (1925), pp. 5–78, figs. 31*).—A large amount of experimental data on the muck soils of Michigan is summarized and discussed, on the basis of which recommendations for the management of these soils for the production of general crops are presented. A list of 28 references to work by others bearing on the subject is included.

The soils of Eastland, El Paso, Lubbock, and San Saba Counties, G. S. Fraps (*Texas Sta. Bul. 337 (1926), pp. 3–47, figs. 2*).—This bulletin deals with the chemical composition of the typical soils in these counties, and includes detailed analyses. These indicate that the upland soils of Eastland and San Saba Counties are on an average deficient in active phosphoric acid, although well supplied with total phosphoric acid. Both the upland and bottomland soils of Eastland and El Paso Counties are deficient in nitrogen. The upland soils of Lubbock and El Paso Counties and all of the bottomlands are well supplied with phosporic acid. All of the soils are well supplied with potash.

Two unusual colloidal soils, C. F. SHAW (*Soil Sci., 20 (1925), No. 5, pp. 419-423*).—Studies conducted at the University of California on samples of collodial soil materials which showed very unusual physical properties and were obtained from the Island of Hawaii and from the dried bed of lower Klamath Lake on the Oregon-California line are briefly reported.

Soil moisture in the field condition varied from 133.84 to 540.08 per cent without seepage. Air-dried samples contained from 8 to 10 per cent of moisture. The moisture equivalent of the Klamath soil was from 348 to 380. The volume weight of the field soils averaged 1.105 on the wet basis, whereas the dry soil was lighter than water and floated.

The loss on ignition showed volatile material to be 31.2 per cent of the Hawaii soil and from 38 to 54 per cent of the Klamath soil. The chemical analysis showed the inorganic matter content to be composed largely of silica, with nearly half the total material volatile.

The influence of hydration on the stability of colloidal solutions of soils, L. C. WHEETING (*Soil Sci., 20 (1925), No. 5. pp. 363-366*).—Studies conducted at the Michigan Experiment Station are briefly reported which showed that at least in the case of negatively charged soil colloids dispersed in water, the state of dispersion or flocculation is governed by the quantity of water of hydration held by the particles. Any treatment which changes the equilibrium will change the stability of the colloid. It is considered that the protective action of emulsoid colloids is probably due to the fact that such colloids have strong hydrating powers, and are therefore able to resist the dehydrating effects of many electrolytes.

The results are taken to indicate that a consideration of the degree of hydration of colloidal particles will clear up many points that have been quite obscure in connection with the stability of colloidal solutions.

The exchangeable bases in some Scottish soils, A. M. SMITH (*Jour. Agr. Sci. [England], 15 (1925), No. 4, pp. 466-475, fig. 1*).—Studies conducted at the Edinburgh and East of Scotland College of Agriculture on the exchangeable iron, aluminum, calcium, magnesium, potassium, and sodium in 20 soils from different parts of the east of Scotland are reported.

Only 3 soils were found to contain iron and aluminum in exchangeable form. The evidence obtained was insufficient to deduce any definite relationship between pH and lime requirement, and the pH could not be correlated with the content of exchangeable bases except in the case of soils similar in character. It is suggested that the differences in the relative proportions of the exchangeable bases indicate that there are on the one hand fundamental differences due to soil type and on the other hand fluctuating differences due to manurial treatment. Emphasis is laid on the fact that the degree of saturation of a soil is not necessarily indicated by the content of exchangeable bases.

Alkali studies.—III, Tolerance of barley for alkali in Idaho soil, R. E. NEIDIG and H. P. MAGNUSON (*Soil Sci., 20 (1925), No. 5, pp. 367-391, figs. 8*).—In a third contribution to the subject from the Idaho Experiment Station (E. S. R., 53, p. 320), the results of studies are reported in which four crops of barley were grown on Idaho soil treated with various concentrations of sodium carbonate, sodium chloride, and sodium sulfate singly and in various combinations.

The toxicity of the salt applications varied with the successive crops. In general, regardless of the type of treatment, the salt additions were most toxic to the first crop. The majority of the salt treatments stimulated the yield of barley in the second crop, while in general the third crop yields showed toxic effects. The yields in the fourth crop of barley showed a tendency to approach normal. The three salt combinations, the concentration

of which gave a soil solution with a higher osmotic pressure than some of the single salt treatments, were usually stimulating to the second, third, and fourth crops. Three-salt mixtures were decidedly toxic to the first crop.

Sodium chloride, when present in a combination that did not exceed the toxic limit for barley, produced the greatest stimulation in the second crop. Sodium sulfate, once it showed toxicity, did not become much more toxic, even with further additions, until very high concentrations were reached.

The results are considered to emphasize the fact that tolerance studies on artificially prepared alkali soils should be interpreted in the light of tolerance of soil for alkali salts rather than tolerance of crops for these salts, since different soils show widely divergent action toward alkali.

Smoke and soil acidity, A. P. Kelley (*Bot. Gaz., 77 (1924), No. 3, pp. 335–339, figs. 2*).—Studies conducted at the University of Pennsylvania are reported which showed that the geographical distribution of acidity in truck soils in the neighborhood of South Philadelphia apparently is not correlated with the location of numerous smoke-producing plants. It has been found possible to keep such soils near neutrality with better cultural methods.

Absorption of nutrients from subsoil in relation to crop yield, J. W. Crist and J. E. Weaver (*Bot. Gaz., 77 (1924), No. 2, pp. 121–148, figs. 9*).—Studies conducted at the University of Nebraska to determine the effects of absorption of nitrates and phosphates from the subsoil on the quantity and quality of barley are reported.

The roots in the controls reached a depth of 30 in., but nitrate fertilizer at any level tended to lessen root depth and greatly increased branching. Phosphates did not noticeably increase root development. Nutrients were absorbed in large quantities at every level to 30 in. Although the plants used the largest amount of salts from the surface foot, they also utilized large additional quantities from the deeper levels when they were available.

Absorption of nutrients at levels below the surface foot was found to affect materially the quantity and quality of the yield. It did not lose its additive effect even when the surface foot was abundantly supplied with a similar nutrient. This is taken to indicate that the chemical composition of the subsoil and the soil solution is very important.

Nitrates increased the total dry weight when applied to the surface foot early in the life of the plant. They increased the dry weight and also the quality of the grain still more when available at lower levels as well as in the surface foot. Phosphorus depressed the yield, particularly that of the straw, somewhat in proportion to the amount absorbed.

The time of the absorption was found to be an important factor. The effects of the nutritive salts were most marked on both the quantity and quality of the yield early and late in the development of the plant. This is taken to indicate that an ample distribution of the deeper portion of the root system in a rich subsoil solution at the later critical period of growth is exceedingly important. Consequently, a knowledge of the development and extent of the roots of crop plants is of primary interest.

The acetone method of extracting sulfur from soil, R. H. Simon and C. J. Schollenberger (*Soil Sci., 20 (1925), No. 5, pp. 393–396*).—Studies conducted at the Ohio Experiment Station on methods of estimating the oxidation of sulfur in soil are reported.

Small charges of soil were found to give measurable results for determining the oxidation of elemental sulfur. The residual sulfates, which are produced in the soil by the oxidation of organic sulfur and are carried into the soil-sulfur mixture, are not affected by the solvent, thus eliminating a condition of error. By determining the amount of the remaining elemental sulfur a

positive measure of the quantity and rate of oxidation is obtained during the entire period of incubation or field practice, and the loss of sulfur as hydrogen sulfide is eliminated as a source of error. Acetone is considered to be a reliable solvent for extracting sulfur from soils where the proportion of applied sulfur is within its solubility.

Dephenolisation in soils, II, N. N. Sen-Gupta (*Jour. Agr. Sci [England], 15 (1925), No. 4, pp. 497–515, fig. 1*).—A second contribution to the subject from the Rothamsted Experimental Station is presented (E. S. R., 45, p. 813).

A number of soils treated with acid and washed free from it were found to possess in high degree the power of destroying phenol. Soils derived from certain geological formations seemed to possess this property more than those derived from others. This effect was obtained from soils treated with sulfuric, hydrochloric, nitric, phosphoric, formic, and acetic acids. The bulk of the loss of phenol was found to be instantaneous, but the maximum loss was attained within about 20 hours. An inverse relation seemed to exist between the period of contact of acid with soil and the extent of subsequent loss of phenol.

The loss of phenol was prevented by ignition of the soil before or after acid treatment, treatment with alkalies or sulfurous acid after acid treatment, and by autoclaving the soil after acid treatment and also in less degree before acid treatment. Phenol was lost the same in ordinary air and in an atmosphere of carbon dioxide. These observations are explained on the hypothesis that manganese dioxide is the agent causing dephenolization.

A striking similarity in behavior was found between an active soil and a mixture of inactive soil and manganese dioxide, and a definite parallelism was established between the manganese content of the soils examined and their powers of dephenolization. Although it seems probable that the dephenolization is caused wholly by manganese dioxide, the effect of acid treatment seems also to involve some other unidentified constituent of the soil.

The evidence obtained is on the whole in favor of manganese dioxide being responsible not only for dephenolization in acid treated soil, but also for instantaneous dephenolization in untreated soil and the slow chemical loss in soil treated with mercuric chloride.

Influence of sodium arsenite on microflora of soil, J. E. Greaves and E. G. Carter (*Bot. Gaz., 77 (1924), No. 1, pp. 63–72*).—Studies conducted at the Utah Experiment Station are reported which showed that sodium arsenite greatly increases the number of organisms in soil which will develop on synthetic agar. The ammonifying organisms were stimulated in only three dilute concentrations by the addition of sodium arsenite to a soil. The soil in which stimulation was noted was a calcareous loam high in organic content. It was found that if the number of ammonifying organisms in a soil is increased by the addition of sodium arsenite, their physiological efficiency is reduced to such an extent that there is a decrease in the accumulation of ammonia.

Sodium arsenite was toxic to nitrifying organisms when added to a soil at the rate of 1 part per million, whereas even 85 parts per million of arsenic in the form of sodium arsenate stimulated the nitrifying organisms. Sodium arsenite was less toxic to ammonifying and nitrifying organisms in a loam soil than in a sand soil and still less toxic in an organic loam than in a silt loam. It is considered probable that the organic colloid forms a loose chemical combination with the arsenic, which protects the bacterial flora against its action.

It is concluded that although comparatively large quantities of arsenates may accumulate in a soil without injuring its beneficial microflora, only small quantities of sodium arsenite may accumulate without producing ill effects.

Nitrification in soils, H. N. Batham (*Soil Sci., 20 (1925), No. 5, pp. 337–351, figs. 4*).—Studies conducted by the Department of Agriculture, United Provinces, India, on soil from the Agricultural College, Cawnpore, which had been utilized for garden purposes for more than 25 years, are reported.

The results indicated that the fluctuations of nitrate content of Indian soils at definite times of the year are similar to those of Iowa soils. Ammonium sulfate was more effectively nitrified than any of the amino acids in the experimental soil. The nitrogen of the compound tryptophane containing both ring and chain nitrogen was more readily nitrifiable than that of compounds containing only chain nitrogen. The average of the results showed that the amino acids are nitrified at about the same rate. Tyrosine and cystine were less available than phenylalanine, leucine, α alanine, and tryptophane.

The presence of sulfur in cystine appeared to depress the nitrification of its nitrogen. The nitrification of amino acids appeared to be independent of the nitrogen-carbon ratio. The amount of nitric nitrogen in the soil fluctuated regularly, and the rise and fall of the activity of the nitrifying bacteria took place at definite periods of the year. The nitrifying bacteria remained active in the soil even when kept in stock for more than a year.

An explanation for the relative effects of timothy and clover residues in the soil on nitrate depression, B. D. and J. K. Wilson (*New York Cornell Sta. Mem. 95 (1925), pp. 3–21*).—Soil cultures containing the roots or the hay of timothy or clover were inoculated with an organism, designated as guttation, which is known to assimilate both nitrate nitrogen and carbohydrates. Some of the cultures were sterile and others were not. The hay was added in equal quantities by weight and by nitrogen content.

Sterile and unsterile water-hay extracts of timothy and of clover were also inoculated with guttation and with another organism known to assimilate nitrate nitrogen isolated from mustard seed. These extracts were added to unsterile soil cultures inoculated with the guttation organism.

The data obtained from the incubation of these cultures appeared to establish the principle that the decomposition of timothy residues in soil is extended over a longer period than is that of clover residues. Since the clover residues are more easily oxidized by the organisms, the number of organisms rises in a relatively short time to higher figures in the cultures with clover. Subsequently the counts fall with the utilization of the more readily oxidizable organic matter. Timothy being less easily oxidized, the earlier counts from its cultures are considerably lower but the later counts exceed those for the cultures with clover. The higher counts maintained in the presence of timothy during the later periods of incubation are considered to be probably due to the fact that the timothy residues are still furnishing energy material for the organisms after that of the clover has been more or less completely utilized. The greater content of nitrogen in the clover is held to be, in large measure, the reason for the greater ease with which the legume is consumed by the organisms.

The above principles were further established not only by the more rapid reappearance of nitrates in soil cultures containing clover hay but also from a comparison of the carbon dioxide evolved from cultures of timothy and of clover. The evolution of this gas was found to be directly proportional to the bacteria counts obtained in the presence of these materials, and to be closely associated with nitrate accumulation.

Since the assimilation of nitrate nitrogen is associated with the process of organic decomposition, the withdrawal of nitrates from the soil solution in a soil in which the residues of clover have been incorporated would not be so prolonged as in a soil in which timothy residues had been introduced, because of the more rapid destruction of the clover material. This order of perform-

ance is offered to explain the characteristic depression of nitrate nitrogen in soil exerted by timothy and clover residues.

Nitrate accumulation under the straw mulch, W. A. ALBRECHT and R. E. UHLAND (*Soil Sci., 20 (1925), No. 4, pp. 253–267, figs. 10*).—Further studies at the Missouri Experiment Station on the subject are reported (E. S. R., 48, p. 720).

A comparison of the low nitrate accumulation in a soil under straw mulch with that in the same soil without mulch in both the field and the greenhouse showed that the failure of nitrates to accumulate was not due to a shortage of ammonia nitrogen, this being present in larger quantities under the mulch than in soil not mulched. Nitrate accumulation was increased in the mulched soil by aeration and by modifying the structure by air drying and remoistening. A combination of these three treatments on mulched soil resulted in the highest nitrate accumulation.

Mulching increased the soil moisture content and produced a marked change in soil structure with less granulation and poor tilth. Soil used as an inoculum from the plat under the mulch had a much lower nitrifying efficiency as measured by change of ammonia to nitrate in solution.

Reducing the moisture content of the soil under the mulch to that of the soil without mulch gave a slight increase in nitrates, while raising the moisture of the unmulched soil to that of the mulched gave it a decided decrease in nitrates. This decrease was prevented by aeration, however. This is taken to indicate that the mulch exerts a depressing influence on nitrate accumulation through decreased aeration as a result of increased soil moisture.

Removing the mulch resulted in a marked increase in nitrate accumulation after two months, while its application to a previously unmulched soil resulted in a marked decrease in the same time even though the moisture remained unchanged.

The results as a whole are taken to indicate that the straw mulch in applications as heavy as 6 tons per acre reduces evaporation, thereby increasing the moisture, lowering the temperature, and preventing the normal exchange of air, all of which induce a poor physical condition and an unfavorable environment for nitrate accumulation.

Effect of cultivation on moisture and nitrate content of field soil, W. H. SACHS (*Arkansas Sta. Bul. 205 (1926), pp. 22, fig. 1*).—Studies are reported which showed that under the conditions of the experiments there was a reduction in the amount of moisture present in the soil as the season advanced from spring to summer. A greater reduction in moisture content took place where vegetation was growing, whether it was a crop or weeds, than on fallow soils. Cultivation to the greatest depth used increased the average moisture content during the most critical period of the growth of corn, but the deepest cultivation was not attended by increased yields of corn. Laying by early permitted weeds to invade the corn field and to lower the moisture content of the soil. The amount of moisture found at a depth of from 7 to 14 in. increased or decreased with the amount found in the overlying surface soil.

The nitrate content of the soil was relatively low in the spring, but as the season advanced, until late summer, larger amounts of nitrate nitrogen were found on the fallow plats. There was little increase in the nitrate nitrogen where a crop was growing. Weeds on uncultivated soils drew heavily on the nitrate nitrogen, reducing the amount found during midsummer to an almost negligible quantity.

Varying depths of cultivation had little effect on the accumulation of nitrate nitrogen in a soil of rather open structure. Although there was considerable difference in the nitrate content of the different plats in October, by the

following March large quantities of nitrates had disappeared and the nitrate content on all plats was found to be at a low and rather uniform level. These results are taken to indicate the importance of winter cover crops as a means of reducing the loss of available nitrogen through leaching.

[Soil fertility studies at the Ohio Station] (*Ohio Sta. Bul. 392 (1926), pp. 17–25, 50, 51, 81, 82*).—A continuation of the comparative tests of acid phosphate and raw rock phosphate has shown the superiority of the acid phosphate (E. S. R., 53, p. 217). No large differences were found between the values of ground limestone and hydrated lime. There was no significant difference evident between the values of the increases produced by the high calcium and the magnesium limes either in the case of the limestones or the hydrated limes. Data are also reported on the fertilization and the manuring of crops, the amount of lime to use per acre, and the relative value of different fertilizer analyses.

Data on the cultivation of garden soils are reported to show that frequent cultivation or stirring of the soil in the garden in ordinary seasons is not necessary to secure high production, and for some crops is actually harmful. Mulching, in addition to increasing the yield, saves hand hoeing or cultivation and keeps the fruit much cleaner. In a test with straw mulch, however, in a light soil where all the straw was plowed under year after year, the mulched plat gave unsatisfactory results. It is thought that the practice of mulching has special application to home gardens only.

Data from fertility tests on district and county experiment farms are also briefly presented.

Fertilizer suggestions for Calhoun County soils, M. M. McCool and J. O. Veatch (*Michigan Sta. Circ. 88 (1925), pp 8, fig. 1*).—Practical information on the fertilizer treatment of the soils of Calhoun County, Mich., is briefly presented.

Fertilizers for special crops, C. J. Chapman and A. R. Whitson (*Wisconsin Sta. Bul. 383 (1926), pp. 30, figs. 13*).—Practical information on the subject is given for such crops as potatoes, canning peas, sugar beets, tobacco, onions, and cabbage, as well as the home garden and lawns.

Commercial status of nitrogen fixation, J. M. Braham (*Chem. and Metall. Engin., 32 (1925), No. 17, pp. 862–864, figs. 3*).—Data on the present trend of the synthetic nitrogen industry are presented which indicate that further reductions in cost may result from improved technology.

The mechanism of the fixation of nitrogen as sodium cyanide, E. W. Guernsey and M. S. Sherman (*Jour. Amer. Chem. Soc., 47 (1925), No. 7, pp. 1932–1940*).—Studies conducted by the U. S. D. A. Fixed Nitrogen Research Laboratory are reported.

The results showed that the formation of sodium cyanide in a mixture of sodium carbonate, carbon, and iron catalyst when heated in nitrogen takes place through (1) the reduction of sodium carbonate to metallic sodium, (2) the formation of sodium carbide from the elements, and (3) the absorption of nitrogen by gaseous sodium carbide to form sodium cyanide. Iron was found to exert a marked catalytic effect on the absorption of nitrogen by sodium carbide, but did not appear to be essential for the reduction of sodium carbonate or for the formation of sodium carbide.

The disintegration of limestone and dolomite separates as influenced by zone of incorporation, W. H. MacIntire and W. M. Shaw (*Soil Sci., 20 (1925), No. 5, pp. 403–417, figs. 4*).—The results of a 4-year lysimeter study of the availability, as measured by ultimate carbonate disintegration, of four limestone separates and a composite, all equivalent to 2,000 lbs. of calcium oxide per

2,000,000 lbs. of soil, as compared with corresponding dolomite treatments to determine the influence of fineness and zone of incorporation are reported.

The 10–20 mesh limestone separate underwent slight change in the surface zone. About 85 per cent of the 20–40 mesh material was decomposed, while practically all of both the 40–80 mesh and the 80–200 mesh materials was disintegrated. The equal part composite approached most closely the value found for the 20–40 mesh separate.

The disintegration of the coarsest limestone separate in the subsurface zone was eight times that in the surface zone. All the other separates likewise showed greater decomposition in the lower soil layer. The maximum influence of fineness upon the ultimate decomposition of the dolomite separates occurred with the 80–200 mesh material.

Each limestone separate showed greater decomposition than the corresponding dolomite separate for both surface and subsurface incorporations. The *coarser the separates, the more marked was the disparity. Both limestone* and dolomite of 80–200 mesh fineness were completely disintegrated in both the surface and subsurface zones for all practical purposes.

Analyses of commercial fertilizers, H. E. Curtis, H. R. Allen, and L. Gault (*Kentucky Sta. Bul. 256 (1924), pp. 175–281*).—Guaranties and actual analyses of 794 samples of fertilizer and fertilizer materials, representing 728 brands, collected for inspection in Kentucky during 1924 are presented.

Analyses of commercial fertilizers, fertilizer supplies, and home mixtures, 1925, C. S. Cathcart et al. (*New Jersey Stas. Bul. 422 (1925), pp. 5–39*).—Guaranties and actual analyses of 735 samples of fertilizers and fertilizer materials collected for inspection in New Jersey during the spring of 1925 are presented, and the results of an examination of 22 samples of home mixtures are tabulated.

AGRICULTURAL BOTANY

The food plants of Porto Rico, O. W. Barrett (*Jour. Dept. Agr. Porto Rico, 9 (1925), No. 2, pp. 61–208*).—A list is given of about 500 species of food and forage plants, with notes on their origin and importance in Porto Rico. The arrangement is alphabetical, according to common names in use in Porto Rico, with cross references to other names.

Plant production as a measure of environment: A study in crop ecology, J. E. Weaver (*Jour. Ecology, 12 (1924), No. 2, pp. 205–237, pls. 5, figs. 14*).—An attempt to determine the precise relation between habitat factors as measured by instruments and plant response as determined by growth is described as carried on for three years at Lincoln, Nebr. (true prairie), at Phillipsburg, Kans. (mixed prairie), and at Burlington, Colo. (short-grass plains association). At each station all important aerial and edaphic factors were measured and compared.

It was readily shown that the water relations of soil and air were controlling, other factors merely contributory. "The yield of pure stands of short grasses (*Bulbilis dactyloides* and *Bouteloua gracilis*), wheat grass (*Agropyron glaucum*), mixed short and tall grasses, and mixed tall grasses was found to decrease from the true prairie through mixed prairie to short-grass plains directly in proportion to available water content of soil and inversely proportional to the evaporating power of the air. The same relation was determined not only for the smaller cereals (oats, wheat, and barley) but also for alfalfa and sweet clover, as well as for maize. The plant yield at each station during different seasons also correlated well with the variations in the water relations.

Since deficiencies in water content were most marked late in the summer, the differences in plant production were often greatest in late maturing tall grasses at the eastern stations. Thus native and crop plants are shown to integrate environmental conditions and to express them quantitatively in yield."

Plant successions of the brush-prairie in northwestern Minnesota, J. EWING (*Jour. Ecology, 12 (1924), No. 2, pp. 238–266, figs. 5*).—The brush prairie is at present a transitional association complex lying between the deciduous forest belt of Minnesota and the western prairie. The history (successional, causational, and transitional) of this region is briefly outlined.

Phases of vegetation under monsoon conditions, W. T. SAXTON (*Jour. Ecology, 12 (1924), No. 1, pp. 1–38, figs. 57*).—An account is given of the ecology of a low-lying area in a district of India which is subject to a well-marked and regular summer monsoon. In this area are found scattered small trees and shrubs, the remaining area being mostly occupied during the early monsoon by grassland. This later gives way partly to a marsh phase, which may be followed by a more xerophytic vegetation.

The conclusion is reached that an association is not necessarily (even if often) a topographical unit, and that the synusium is to be preferred to the association as the fundamental unit of ecology.

Wilting of plants in its connection with drought resistance, N. A. MAXIMOW and T. A. KRASNOSSELSKY-MAXIMOW (*Jour. Ecology, 12 (1924), No. 1, pp. 95–110*).—The investigations here described are divided into experiments on the wilting of plants having a large daily water deficit and on those plants having a small deficit, the two groups behaving in very different ways.

The authors judge from observation in this work similar to that recorded by Knight (E. S. R., 49, p. 521) that the ready loss of turgor observed in plants of the type of Impatiens really show that the cell walls are slightly expanded by the inner cell pressure, and that the very slight reduction of the volume of the cell content is sufficient to lessen considerably the tension of the cell walls.

It is thought that the daily water deficit on bright days is characteristic of the desert of Arizona, the steppes of the Caucasus, and the cool, humid climate of Leningrad, the plants losing to the air at midday more than they take up from the soil at that time. Apparently, leaves of plants subjected at midday to direct sunlight are near the limits of wilting. One of the features of drought-resisting plants is capacity for enduring relatively large losses of water.

Visible loss of turgescence on small water decrease shows very weak cell wall distention, which may be in accordance with comparatively low cell sap concentration. Under prolonged wilting xerophytic plants may without harm lose half of their water content, whereas in mesophytic plants emptying and shedding of the leaves would result. Bog plant leaves can not endure prolonged wilting. A small water loss may without perceptible turgor loss start drying out in such leaves.

"As wilting is accompanied by an extreme reduction of the rate of transpiration, it must be considered as one of the principal means of preserving the plant's water content in periods of drought. It follows, therefore, that the most essential feature of a xerophytic organization is the capacity of resisting prolonged wilting without suffering any harm. The rate of transpiration, when water is normally absorbed from the soil, can not be used for judging the drought resistance of a plant."

An apparatus for photographic recording of quadrats, W. S. COOPER (*Jour. Ecology, 12 (1924), No. 2, pp. 317–321, figs. 2*).—An attempt to construct an apparatus suitable for taking comparable photographs, from a vertical position, of plants under study year after year is described with figures. All sup-

porting parts are placed on one side of the plat, which is left entirely unshaded.

The vitality and distribution of seeds, J. C. SHENSTONE (*Jour. Bot. [London], 61 (1923), No. 732, pp. 297–305*).—The problem of the origin of plants springing up, with no apparent probability of recent seeding, after fires in old cities or other modes of clearing, is not regarded as yet certainly solved by consideration of any facts here collected. However, in some cases the plant seeds apparently came recently from some near-by areas. Much evidence has been gained that seeds of field plants frequently retain viability long enough to enable them to take advantage of any favorable opportunity for germination. Means and cases of distribution of seeds, as also discussed, include movements of various media.

Seed stimulation, time of ripening, and yield in tomatoes [trans. title], W. GLEISBERG (*Zellstimulationsforsch., 1 (1924), No. 1, pp. 87–98*).—Tabulation and discussion show that the modification of germination by seed treatment with a Popoff stimulating mixture of sulfates of magnesium and manganese is continued in the stimulation of growth in the plant, though earliness appears not to be increased by this means as by weather.

After effects of stimulation on seed [trans. title], W. GLEISBERG (*Zellstimulationsforsch., 1 (1924), No. 1, pp. 75–86, figs. 2*).—Experimentation on chemical stimulation (with a mixture of 30 per cent solutions of $MgCl_2$ and $MgSO_4$) of seeds is described and tabulated, this work having been done with stock beets, barley, peas, and beans.

Stimulation studies with buckwheat [trans. title], G. PASPALEFF (*Zellstimulationsforsch., 1 (1924), No. 2, pp. 149–169, figs. 17*).—An attempt was made to study, with *Polygonum marginatum* and *P. rotundatum* (both derived from *P. fagopyrum*), the chemically stimulating effect of solutions as reported by Popoff (see below) as to its persistence and perceptibility in the second generation and as to whether cytological alterations could be made out in the altered plants. The present report gives the extensive details of this work. Apparently, lines twice stimulated outgrew lines once stimulated, and these outgrew lines not stimulated.

Data from field studies during 1922–1923 with stimulated seeds [trans. title], M. POPOFF (*Zellstimulationsforsch., 1 (1924) No. 2, pp. 171–237, figs. 5*).—The method and outcome are outlined of seed stimulation with chemicals in case of a number of field crops.

Rooting and grafting of cuttings after stimulation [trans. title], M. POPOFF and W. GLEISBERG (*Zellstimulationsforsch., 1 (1924), No. 1, pp. 99–116, figs. 13*).—Cuttings subjected before planting to stimulation in solutions of organic or inorganic substances showed varying effects from the treatment. These are described.

Cell stimulants and their theoretical bases [trans. title], M. POPOFF (*Zellstimulationsforsch., 1 (1924), No. 1, pp. 3–38, figs. 5*).—The author's assumptions that all agents that are to be chemically stimulating to cell functioning are fundamentally favorable to the oxidation processes in the living cell, its protoplasm, and its molecules, and that the consequences of this increase in the oxidation processes are the acceleration of life processes and immediately of growth and of cell increase, necessitated also the assumption that substances, to be stimulating, must possess decided affinity for oxygen. The present work, based upon this and other assumptions, shows in some detail the results of employing various stimulating substances with growing plants.

Cell stimulants and their theoretical foundations.—II, Physical stimulants [trans. title], M. POPOFF (*Zellstimulationsforsch., 1 (1924), No. 2, pp. 257–264*).—The present article deals more particularly with the cell-stimulating

influence of temperature, both as contrasted with chemical stimulation and as combined therewith. Maize seed subjected to stimulation during some hours at thermostatically controlled temperatures (50 to 55° C.), and then allowed to germinate at ordinary temperature (20°), gave larger and stronger plants. The influence of (heightened) temperature shows some analogies to the influence of decreased pressure. Other physical factors are discussed.

Manuring, fertilizers, and cell stimulation [trans. title], M. Popoff (*Zellstimulationsforsch., 1 (1924), No. 1, pp. 117–128*).—Empirically worked out popular methods of crop manuring have in cell stimulation their proper explanation and scientific justification, though corrections are necessary, and regard must be had to the development as a whole of the stimulated plants and to the whole range of stimulation effects.

The relationship between the concentration of the soil solution and the physicochemical properties of the leaf-tissue fluids of Egyptian and Upland cotton, J. A. Harris (*Jour. Agr. Research* [U. S.], *32 (1926), No. 7, pp. 605–647, figs. 6*).—Continuing studies of previous investigations (E. S. R., 51, p. 331) an examination was made of the homogeneity or heterogeneity of the field in which the plants were grown and the influence of soil salinity upon the various characteristics of the plants.

Statistical analysis of the data showed further evidence of the existence of substratum heterogeneity with respect to physical factors of the soil in very small experimental plats, and that it is possible to determine in quantitative terms the correlation coefficient of the relationship between the physical and chemical properties of the soil of different portions of the field and the character of the crop produced therein.

The author claims that since the relationship between soil properties and plant characteristics can be measured in terms of correlation and be expressed by a regression curve, it may be possible in the future to predict more precisely than is now possible the character of the crop which would be produced by a field of given characteristics in a normal year.

Plant coloration and its biological significance, F. Rodrigues da Silveira (*Da Chromatogenia Vegetal e sua Significação Biologica. Rio de Janeiro: Revista dos Tribunaes, 1923, pp. 109*).—A short historical account is followed by statements bearing upon pigmentary origins, chemical classifications, structures, properties, functions, behavior, and groupings.

GENETICS

[**Breeding experiments with buckwheat**], S. A. Egiz (Eghis) (*Trudy Prikl. Bot. i Selek.* (*Bul. Appl. Bot. and Plant-Breeding*), *14 (1924–25), No. 1, pp. 235–251, fig. 1*).—The importance of pistil length and the effects of hybridization and self-fertilization were studied near Leningrad in an attempt to devise a method of buckwheat breeding.

The pistil characters appeared to depend on a single factor pair *K k*, and similarly the height character on the pair *T t*. Cross pollination gave as favorable results as close pollination, and repeated crossing did not result in degeneration as observed in certain instances of self-fertilization. Other races made a good response to self-pollination. Flowers with short pistils gave better results in hybridization than long-pistiled flowers because of their more favorable structure and greater response to pollination.

Inheritance of anthocyanin in Crepis, J. L. Collins (*Science, 63 (1926), No. 1619, p. 52*).—This is a contribution from the University of California.

A study of the asexual inheritance of stooling habit of sugar cane seedlings, J. O. Unite (*Philippine Agr., 14 (1925), No. 6, pp. 329–345, pl. 1*).—

Investigation of the stooling habit in sugar cane seedlings at Los Banos, P. I., showed that young first and second generation sexual seedling canes of the same age and parentage varied widely in total number of shoots. The number of shoots of young seedlings was generally maintained up to maturity, and apparently may indicate the stooling power of mature seedlings. Considering extreme types, the stooling power of young seedlings seemed correlated with the average height of stalks of mature seedlings. The stooling habit of first and second generation sexual seedlings was not inherited by their first vegetative or asexual offspring. Therefore, the stooling power of mature seedlings could not serve as a guide in selection of seedlings for subsequent vegetative propagation. The stooling habit of first generation plant canes was inherited by their first generation ratoon offspring.

The stimulative effect of hybridization in breeding productive tobacco [trans. title], F. Frimmel ([*Czechoslovakia*] *Min. Zěmědel., Zpr. Výzkumn. Úst. Zeměděl (Mitt. Landw. Versuchsanst.), No. 4 (1924), pp. 36+VIII, figs. 27*).—The relative values of 15 varieties of tobacco as parents in hybrids were studied at the Mendel Institute in Lednice (Eisgrub), the varieties being ranked in degree of stimulation as shown in height, number of leaves, and yield. *Heterosis was especially pronounced in the* F_1 hybrid generation in some sorts of tobacco, slight in others, and variable in yet others. Combinations giving significantly better yields than the best comparative variety, Debreziner, were Manila×Debreziner, Manila×Virginia Long Leaf, Manila×Maryland, Brazil×Manila, and Gold Leaf×Latakia. The fact that practically worthless material was obtained in F_2, even from the best combination, Manila×Debreziner, requires that seed for practical use be produced by means of crosses made anew each year.

Contribution to the genetics of Triticum spelta and T. vulgare, I [trans. title], G. Nilsson-Leissner (*Hereditas, 7 (1925), No. 1, pp. 1–74, figs. 19*).—The behavior of the progenies of crosses between *T. spelta* and *T. vulgare* was studied, employing Swedish Velvet winter wheat (0700)×awned winter spelt (winter series), and Panzer II winter wheat×awned spring spelt (spring series). The F_1 generation was intermediate in all essential characters, while the F_2 and subsequent generations showed segregation of many characters. The so-called spelt characters as a rule seemed to show segregation involving a single gene or a very closely linked complex of genes. When modifying factors are absent this gene (=complex) (*s*) seems to be recessive. The shape of the outer glumes may vary widely, regardless of other spelt characters.

The author attempted to explain the differences found between speltoids and *T. spelta*. The former are to be regarded as recessives to *T. vulgare*, while *T. spelta* seems to dominate *T. vulgare*. The speltoids as well as *T. spelta* are devoid of a factor (*S*) present in *T. vulgare*, and the spelt characters in the speltoids are more dilute than in *T. spelta*.

Six chimaeral spikes intermediate between *T. Spelta* and *T. vulgare* found in the hybrid progenies probably originated through vegetative segregations in the heterozygotic plants. Other peculiarities observed were short ramification of spike wherein one or two flowers in one or several spikelets are replaced by whole spikelets, long ramification wherein certain spikelets grow into whole branches bearing up to 7 perfect spikelets, spikes with bifurcate rachis, and two distinct types of "additional spikelets." Segregation for spring and winter habit is also considered.

An English abstract is included (pp. 69–74.)

Segregation and correlated inheritance in Marquis and Hard Federation crosses, with factors for yield and quality of spring wheat in Montana, J. A. Clark and J. R. Hooker (*U. S. Dept. Agr. Bul. 1403 (1926), pp. 71, pls. 2,*

figs. 12).—To determine the factors for yield and quality of spring wheat upon the dry lands of Montana, the behavior of several generations from reciprocal hybrids between Hard Federation and Marquis wheats were studied in cooperation with the Montana Experiment Station under three distinct environmental conditions in the State.

The behavior of dwarf plants appearing in the F_2 in all of the 12 F_1 families studied was explained on a 2-factor genetic basis by assuming *DD* a factor for dwarfs and *NN* an inhibitor or factor for normals. A 2-factor genetic interpretation of the inheritance of awnedness was made on the basis of primary (*A*, *a*) and secondary (*B*, *b*) factor pairs. Brown glumes were dominant to white, simple ratios being noted. Red kernels were dominant to white, and in the F_2, 10 of 12 F_1 families segregated close to a 2-factor 15:1 ratio and the two others close to the single factor 3 : 1 ratio.

In F_2 early heading was partially dominant, although no large early and no small late groups appeared. In time of ripening, in average fruiting period, and in crude protein content of grain the hybrids were intermediate to the parents. From F_2 and F_3 studies, all gradations between the parents were observed in average height. On the average, F_2 plants exceeded both parents in yields at the station. Certain exceptions to these tendencies and the relative variability of the hybrids and parents are indicated.

In using the average yield per plant × crude-protein content to measure the improvement made over the parents, the six leading strains at the three localities exceeded the best Marquis check rows by from 1.5 to 81.8 per cent, this improvement apparently being obtained by combining the advantages of the long fruiting period of Hard Federation and the height of Marquis.

Important and significant negative correlations were obtained between heading period and fruiting period and large positive correlations between ripening period and fruiting period. The longer fruiting period and greater height were the most important factors positively correlated with larger yields. Fruiting period, height, and yield were, on the average, all negatively correlated with crude-protein content.

Inheritance of resistance to leaf rust, Puccinia triticina, in crosses of common wheat, Triticum vulgare Vill, E. B. Mains, C. E. Leighty, and C. O. Johnston (*Jour. Agr. Research* [*U. S.*], *32* (*1926*), *No. 10, pp. 931–972, pls. 5*).—The results are given of field nursery experiments in Virginia and at the Tennessee and Indiana Experiment Stations with hybrids of Kanred and Malakoff wheats crossed with various varieties of common wheat, and of greenhouse studies at Lafayette, Ind., and Manhattan, Kans., with hybrids between resistant Fulcaster and Kanred, and hybrids of Malakoff with several other varieties. The inheritance of resistance to leaf rust in the various crosses was studied.

Four generations of crosses in which Kanred was the resistant parent showed that resistance in this variety may depend on several factors. A study of 11 crosses with Malakoff showed that in some cases the resistance was dominant, but on account of a mixture of physiological forms of leaf rust in the field definite conclusions could not be drawn concerning the factors involved. Greenhouse studies with 9 crosses with Malakoff showed that the resistance of Malakoff toward certain physiological forms of rust is dependent on a single dominant genetic factor. Tests of other crosses with several physiological forms of leaf rust are reported upon.

It is claimed that resistance to various physiological forms of leaf rust is due to different factors, or groups of factors inherited as a unit, the different factors or groups being independently inherited. These may be brought

together, thus uniting in a single strain the resistance to the various physiological forms possessed by different varieties.

Inheritance of resistance to bunt, Tilletia tritici (Bjerk.) Winter, in wheat, F. N. BRIGGS (*Jour. Agr. Research* [*U. S.*], *32* (*1926*), *No. 10, pp. 973–990, figs. 5*).—The inheritance of resistance to bunt in wheat was studied in three generations of crosses of susceptible × susceptible, resistant × resistant, and resistant × susceptible varieties of wheat.

Hard Federation, Baart, and White Federation produced from 50 to 95 per cent of disease during the five years they were under investigation, while Martin and Hussar were bunt-free. Hard Federation and Baart differed slightly in their susceptibility to bunt, and from a cross between these varieties no plants were isolated that were more resistant or more susceptible than the parents. The three susceptible varieties are considered as completely susceptible. Resistance to bunt in Martin was completely dominant, and in Hussar it was almost completely dominant, as indicated by the F_1 generation. It is believed that Martin differs from Hard Federation and from White Federation in one dominant factor for resistance. Hussar is believed to differ from Hard Federation and Baart in two dominant factors, one of which is identical with the factor in Martin.

On the basis of the author's experiments it is believed that it should be a simple matter to use Martin and Hussar in breeding for bunt resistance.

Polyploidy in Zea mays L., L. F. RANDOLPH and B. MCCLINTOCK (*Amer. Nat., 60* (*1926*), *No. 666, pp. 99–102, figs. 8*).—A plant which appeared in a culture of *Z. mays*, grown at the New York Cornell Experiment Station in cooperation with the U. S. Department of Agriculture, possessed 30 chromosomes which at diakinesis were usually arranged in 10 trivalents. As compared with diploid (10 pairs of chromosomes) plants of the same culture, the triploid plant was notably more vigorous and had a thicker stalk, broader leaves, stouter tillers, larger anthers, and distinctly larger microsporocytes. Genetically, the plant appeared to be a dilute sun red with a heterozygous tunicate tassel. The history of the chromosome complement was traced from the late prophase of the first meiotic division through the second meiotic division.

The development and inheritance of a defective endosperm in maize, B. L. WADE (*West Virginia Sta. Bul. 197* (*1925*), *pp. 20, figs. 4*).—Further study was made of the defective endosperm in corn noted earlier (E. S. R., 51, p. 229).

A single main factor difference seemed responsible for the inheritance of the defective endosperm. This factor difference appeared to be expressed in both endosperm and in the resultant plant as a whole. No significant difference seemed to exist in the percentage of pollen abortion by normal and by defective plants. Before fertilization and for six days thereafter no difference was observed between normal and defective florets, and none was apparent in the development of the endosperm of homozygous normal, heterozygous normal, and homozygous defective seeds.

Plum investigations.—II, The inheritance of hardiness, M. J. DORSEY and J. BUSHNELL (*Minnesota Sta. Tech. Bul. 32* (*1925*), *pp. 3–34, figs. 3*).—Records taken following the severe winter of 1917–18 upon a Prunus population comprising 1,322 individuals of known but widely different genetic origin showed that the various species have distinct values as sources of hardiness. For crossing with tender species, *P. nigra* and *P. americana* were of first rank as sources of hardy seedlings for Minnesota. In general, where both parents were hardy the progeny were all hardy, where both parents were tender the progeny were tender, and where the parents contrasted sharply in this characteristic gradations occurred in the progeny, with intermediate individuals

rather scanty in number. There were no outstanding differences in hardiness of the F_1 generation where different variety combinations representing the same species were used.

In crosses between *P. americana* and pure and hybrid forms of *P. triflora* a much larger proportion of the progeny were hardy when *P. americana* was used as ovule parent than in the reciprocal crosses, suggesting the advisability of using the hardier plant as pistillate parent. Some very desirable seedlings from the point of view of fruit quality were obtained in the cross *P. americana* × *P. triflora* hybrids. That P. nigra is an even better source of hardy seedlings than *P. americana* was indicated in crosses of both species on Shiro, in which instance a considerably larger proportion of the Shiro × *P. nigra* seedlings were hardy. Results with *P. besseyi* obtained from South Dakota were rather unsatisfactory, suggesting to the authors the desirability of obtaining this species further north in its range.

Observations on the nature and extent of injury in the various trees showed winter injury to be distributed throughout the various parts of the tree. For example, in no case were individuals found in which the flower buds were hardy and the bark or wood severely injured.

An earlier contribution from the station on plum investigations has been noted (E. S. R., 42, p. 534).

Chromosomes and their significance in strawberry classification, A. E. Longley (*Jour. Agr. Research [U. S.], 32 (1926), No. 6, pp. 559–568, figs. 2*).—The author claims that Fragaria species can be grouped into classes, similar to those found in other polymorphic genera of the Rosaceae, according to the number of chromosomes found at diakinesis. The diploid group has 7 chromosomes as the basic or haploid number and is represented by *F. vesca* and its varieties. The hexaploid group has 21 as its haploid chromosome number and is represented by 2 varieties of *F. elatior*. The octoploid group has 28 haploid chromosomes and includes the 2 American species *F. chiloensis* and *F. virginiana* and many, if not all, of the outstanding horticultural varieties. Sex or dioeciousness in the genus Fragaria is claimed to be associated with a high chromosome number, and its genetic behavior is in accord with what is to be expected from a duplication of chromosomes such as exists in true polyploid forms. Cytological evidence is said to support the genetic work of Millardet (E. S. R., 6, p. 507), where the crosses attempted between American and European species resulted in hybridization without crossing, or false hybridization.

Observations on pre- and postpubertal oogenesis in the white rat, Mus norvegicus albinus, M. H. Cowperthwaite (*Amer. Jour. Anat., 36 (1925), No. 1, pp. 69–89, figs. 8*).—The results of a study of oogenesis in the white rat are reported from the Washington University, St. Louis.

Three series of ovaries were used for the study, one consisting of ovaries taken from females ranging in age from birth to 8 days. The second series was taken at 10-day intervals from females ranging in age from 10 to 90 days. The third series was procured on the first, second, third, fourth, fifth, and sixth days after the females had produced two successive litters. The young of both litters were removed at birth and the females were allowed to mate. The first series was selected primarily for studies of the nuclear structure of the germ cells and details of follicular formation. The second series showed the ovarian changes occurring during weaning, puberty, and the attainment of sexual maturity. The third series showed the changes during the entire oestrous cycle.

The results of the study indicated that synapsis was completed by the fourth day after birth and that no germinal epithelial cells undergo meiosis before or

after puberty. There was no evidence of a cyclical proliferation of new germ cells from the germinal epithelium after the attainment of sexual maturity. The cortical follicles remained in a retarded state of development long after the medullary follicles had matured or become atresic.

It is suggested that the production of young follicles in mature ovaries may result from the growth of certain cells of the germinal valleys. If synapsis be considered as the criterion of the definitive oocyte, oogenesis is apparently not continued through pre- and postpubertal life.

FIELD CROPS

[Field crops experiments in Georgia, 1925] (*Georgia Sta. Rpt. 1925, pp. 95–98, fig. 1*).—The leaders in varietal trials (E. S. R., 53, p. 230) with winter wheat, winter and spring seeded oats, barley, rye, and cotton are pointed out, with comment on significant observations in other investigations.

The characteristics of the progenies of wheat × rye hybrids are set forth. In one selfed strain of rye, normal grass-green, lighter elm-green, and nongreen plants appeared in about a 12 : 2 : 2 ratio. The nongreens were in a ratio of about 3 pinks to 1 albino. In another strain 3 normal greens appeared for each apple green. Some florets produced double and also triple grains.

Lone Star, Delfos, and Acala led the cotton varieties during a very dry season. Since on removing weeds with a hoe there was produced 804 lbs. of seed cotton, with 3 cultivations 731 lbs., and with 6 cultivations 634 lbs., cultivation probably depressed yields. Slow-acting forms such as cotton seed, peanut meal, and velvet bean meal, produced the highest yields among various sources of nitrogen. A small increase was obtained where cotton was topdressed with sodium nitrate and ammonium sulfate at planting time, while a small decrease resulted when the application was made at chopping time or when the plants were squaring. Further determinations verified previous data, showing that sulfur preserves both the organic and the inorganic nitrogen in compost mixtures. The percentages of oil in cotton seed and the acre production of cottonseed oil by 25 varieties and strains are tabulated.

[Agronomic experiments in Guam, 1924], J. Guerrero (*Guam Sta. Rpt. 1924, pp. 5–12, figs. 4*).—Experiments continuing previous work (E. S. R., 53, p. 430) included plat and fertilizer tests with forage grasses, variety tests with adlay, sweet potatoes, yams, and taro, and fertilizer tests with sweet potatoes.

In their first crop, Napier grass and Japanese cane plats receiving lime with manure yielded highest, and plats receiving lime alone were second, whereas the plats of Guatemala grass receiving lime, manure, and lime with manure produced in the order given.

Comparisons of the efficiency of cover crops showed the production cost to be highest and similar for velvet beans and pigeon peas, and of the two, pigeon peas suppressed weed growth much longer. Pigeon peas required longer cultivation than the other crops, but use of the cultivator reduced the work cost, whereas with the vine crops hand cultivation was required after vining had begun. Mung beans and cowpeas covered the ground soonest but occupied it for the shortest time. Pigeon peas were much less damaged by heavy continuous rains than the other crops.

On newly broken grassland barnyard manure resulted in higher yields than lime, sulfur, or green manure, the total grain yield of the two crops being more than twice that of the untreated plat. Rotated plats of corn, cowpeas, and velvet beans surpassed continuous plats in yield.

Of the several fertilizers used on imported sweet potatoes acid phosphate in combination with ammonium sulfate gave the highest percentage increase in average yield over the unfertilized plat; with the native varieties acid phos-

phate with either sodium nitrate or barnyard manure gave the best results. Triumph and Nancy Hall led the imported varieties during the rainy season, while native sorts failed to set tubers. Strassburg and Triumph led imported varieties in the second crop, and Yap led the native strains.

Recommended varieties of farm crops for Minnesota, A. C. Arny and H. K. Hayes (*Minnesota Sta. Bul. 226 (1925), pp. 31, figs. 5*).—Varieties of farm crops recommended for Minnesota on the basis of experimental results include Marquis, Mindum durum, and Minturki wheat; Gopher, Victory, Minota, and Improved Ligowa oats; Velvet, Improved Manchuria, and Minsturdi, all 6-rowed, and Svansota 2-rowed barley; Swedish and Rosen rye; Winona, Chippewa, Redwing, and North Dakota Resistant No. 114 flax; Minsoy, Wisconsin Black, Chestnut, Habaro, Elton, Manchu, and Soysota soy beans; Golden Vine field peas; and Grimm alfalfa. For both grain and silage the authors suggest Silver King, Murdock, Rustler, and Minnesota 13 corn for the southern section of the State and Minnesota 13 and Rustler for the central section; for grain in the northwestern and north-central section Dakota White, Gehu, Squaw, and Pearl flint, and Northwestern, Minnesota 23, Minnesota 13, Haney, and Moccasin dent varieties, and for silage Minnesota 13 and Northwestern Dent; and in the northeastern section for grain Dakota White, Gehu, and Squaw flint, and for silage Northwestern Dent and Minnesota 13.

Northeast Missouri Crops Experiment Field second annual report, 1925, C. A. Helm (*Missouri Sta. Circ. 144 (1926), pp. 4*).—The yields of varieties of wheat (E. S. R., 52, p. 334), corn, grain sorghum, soy beans, oats, and barley are tabulated in this report.

[Field crops experiments on the Huntley, Mont., Field Station in 1923 and 1924], D. Hansen (*U. S. Dept. Agr., Dept. Circ. 369 (1926), pp. 1–21, 22–27, 30–32, figs. 8*).—Report is made by D. A. Savage of the progress of investigations with field crops under irrigation (E. S. R., 54, p. 132) embracing rotation experiments, variety and seeding tests with corn, seeding tests with sugar beets, and comparison of dry land and irrigated seed potatoes. The relative effects of alfalfa and manure on the yields of crops in the rotations are discussed in some detail. Experiments in dry land agriculture reviewed by A. E. Seamans included crop rotations, comparison of the yields of winter wheat, oats, barley, flax, and corn from different methods of production, variety tests with potatoes, corn, spring wheat, and field beans, and a spacing test with beans. Meteorological and agricultural conditions on the project are described as usual.

[Field crops experiments in Ohio] (*Ohio Sta. Bul. 392 (1926), pp. 26–32, 41, 47–49, 83, 85, 86, fig. 1*).—The progress is reported of agronomic investigations (E. S. R., 53, p. 529) including crop rotation tests, pasture improvement studies, variety tests with corn, germination tests of corn harvested in early stages of maturity, storage trials with potatoes, study of the changes in seed potatoes during the planting period, trials of flax-cereal and cereal mixtures, comparisons of Ohio certified seed potatoes (E. S. R., 55, p. —), crop production on drained and undrained land, fertilizer tests with tobacco in rotation, and an intensive study of Canada thistle (E. S. R., 53, p. 740).

Emergency hay and pasture crops, C. R. Megee (*Michigan Sta. Spec. Bul. 150 (1926), pp. 13, figs. 6*).—Crop varieties and cultural practices are suggested for emergency hay and pasture crops in the Upper and Lower Peninsulas of Michigan.

The effect of outside rows on the yields of plots of kafir and milo at Hays, Kans., J. S. Cole and A. L. Hallsted (*Jour. Agr. Research [U. S.], 32 (1926), No. 10, pp. 991–1002, figs. 2*).—The 2 outside rows of 10-row tenth-acre plats of kafir and of milo were harvested separately from the 8 inside rows

during 8 years of experiments at the Hays, Kans., Substation in cooperation with the U. S. Department of Agriculture. The plots were 2 by 8 rods, with rows 40 in. apart and plants about 8 in. apart in the row.

The outside rows generally outyielded the inside rows, except in a year with unusually low temperature and heavy precipitation. The averages show excesses in favor of the outside rows of about 30 per cent for kafir grain and 7.5 per cent for kafir stover, and about 43 per cent for milo grain and about 8 per cent for milo stover. The excess yield of grain from the outside rows was roughly proportionate to the increased soil area available to them. Since the relationship between the yields from all 10 rows and the inside 8 rows was linear, the correlation being very nearly perfect, the relative merits of the methods represented could be determined as well by using all 10 rows as by rejecting the outside rows.

Development in immature barley kernels removed from the plant, H. V. Harlan and M. N. Pope (*Jour. Agr. Research* [*U. S.*], *32* (*1926*), *No. 7, pp. 669–678, pl. 1, fig 1*).—Culms of Hannchen (2-rowed) barley with immature heads were cut soon after pollination at Aberdeen, Idaho, in cooperative investigations with the Idaho Experiment Station, and also at Arlington, Va.

Studies on the developing kernels (E. S. R., 43, p. 826) showed that immature barley kernels kept moist on the culm after sampling continue to grow, both in endosperm and in embryo, for at least 8 days after harvest. Embryos of immature kernels allowed to air dry on the culm continued to grow for at least 8 days after sampling. Their final length, however, was about 40 per cent less than when the culm was kept moist. Embryos of immature kernels dried in the glumes seemed to grow about as much as those dried on the culm. Growth was not evident in immature kernels removed from the culm, separated from the lemma and palet, and air dried. Embryos of naked immature kernels kept moist may grow but not consistently, and it seemed that the growth of such embryos must have occurred at the expense of the soluble food supply in surrounding tissues. Since the immature kernel almost certainly abstracts nutrients from the culm after harvest, apparently the changes occurring in the shock of grain harvested at maturity may be of importance.

Buckwheat in Michigan, C. E. Cormany (*Michigan Sta. Spec. Bul. 151* (*1926*), *pp. 11, figs. 8*).—Practical information is given on varieties of buckwheat, cultural and field practices, and the uses of the crop as a soil renovator, cover crop, bee pasture, emergency crop, and as a weed destroyer.

Report on Missouri cotton experiment fields, 1925, B. M. King (*Missouri Sta. Circ. 141* (*1926*), *pp. 7, figs. 3*).—The results of variety, fertilizer, and spacing tests with cotton at the station and in different localities in southeastern Missouri as detailed in this report have been noted elsewhere (E. S. R., 53, p. 234; 54, p. 732).

Emmer (Triticum dicoccum) [trans. title], E. Stoletova (*Trudy Prikl. Bot. i Selek.* (*Bul. Appl. Bot. and Plant-Breeding*), *14* (*1924–25*), *No. 1, pp. 27–111, figs. 9*).—The history of emmer is briefly reviewed, and the distribution and production centers of the crop in the Northern Hemisphere are pointed out. The culture of emmer is shown to be connected with the ethnographical composition of the population, the crop having been preserved chiefly among peoples who cling to their ancient secular customs and traditions. *Avena sativa*, *A. brevis*, and *A. strigosa* have been shown by N. I. Vavilov to be constant attendants of emmer; he suggests that oats found as impurities in emmer might have been the progenitors of cultivated oats. In wild-growing and in cultivated *T. dicoccum* the same variation of characters as in durum and soft wheats was observed, emmer also being subject to the law of homological series (E. S. R., 49, p. 822). *T. dicoccum farrum* has been subdivided into

nine races and *T. dicoccum rufum* into six races, and a new variety, *T. dicoccum nigrum*, has been established.

An extensive bibliography is included, also an English abstract (pp. 106–111).

Johnson grass: Its production for hay and pasturage, H. N. VINALL (*U. S. Dept. Agr., Farmers' Bul. 1476 (1926), pp. II+21, figs. 7*).—The origin, distribution, and characteristics of Johnson grass (*Sorghum halepense*) are set forth, with information on establishing and maintaining meadows, hay, and seed production practices, marketing and utilizing the hay, pasturing, and the status of the grass in general agriculture and as a weed. The publication is intended only to indicate the best methods of utilizing Johnson grass where already established and not to encourage in any way its spread to new areas.

Johnson grass, a noxious weed in Sudan grass [trans. title], A .I. MAL'TSEV (A. J. MALZEW) (*Trudy Prikl. Bot. i Selek. (Bul. Appl. Bot. and Plant-Breeding), 14 (1924–25), No. 1, pp. 280–292, figs. 5*).—Johnson grass (*Andropogon halepensis*) may be a dangerous pest for Russia in case it is introduced with Sudan grass seed imported from America. In Russia it is found only in Transcaucasia and in the Central Asiatic republics.

A contribution to the classification of Panicum miliaceum L. [trans. title], B. M. ARNOL'D (ARNOLD) (*Trudy Prikl. Bot. i. Selek. (Bul. Appl. Bot. and Plant-Breeding), 14 (1924–25), No. 1, pp. 252–270, pl. 1*).—Proso (*P. miliaceum*) is classed systematically according to the color of the grain rather than with regard to the shape of the panicle. Four newly described varieties pertaining to the effusum group, four to the contractum group, and five to the compactum group are included in the classification.

Value of certified Irish potato seed in Mississippi, H. H. WEDGWORTH and C. B. ANDERS (*Mississippi Sta. Circ. 60 (1925), pp. [4], figs. 4*).—Certified seed from Nebraska and Wisconsin produced the highest yields and best stands and had low percentages of mosaic in comparison with local uncertified stock.

The rice varieties of Turkestan [trans. title], M. UKLONSKAÎA (OUKLONSKAJA) (*Trudy Prikl. Bot. i Selek. (Bul. Appl. Bot. and Plant-Breeding), 14 (1924–25), No. 1, pp. 165–176*).—The botanical and agronomic characteristics of Central Asiatic varieties of rice are described, and the results of comparative tests are tabulated.

Kashgar rice is more mixed than that of Tashkent and Fergana, whereas the rices of Bokhara and Khoresm are comparatively pure. Most widespread in Turkestan is *Oryza sativa vulgaris*, followed by *O. sativa erythrocoros* and *O. sativa caucasica*; less frequently occur *O. sativa ianthoceros*, *melanoceros*, *pyrocarpa*, *desvauxii*, *rubra*, *italica*, and *sundensis*.

Smooth-awned rice [trans. title], A. K. GOL'BEK (HOLBECK) (*Trudy Prikl. Bot. i Selek. (Bul. Appl. Bot. and Plant-Breeding), 14 (1924–25), No. 1, pp. 177–184, fig. 1*).—Studies at Leningrad showed that rice varieties of Central Asia can be grouped as those with large and elongated kernels and with short and rounded kernels. Three gradations were also noted in the character of roughness of the awns and paleae, i. e., smooth-awned, semismooth-awned, and coarsely rough-awned. Coarsely rough-awned rices prevail in Central Asia, showing admixtures of semismooth-awned forms. Comparisons of the material, as well as literary data, suggest that smooth-awned and semismooth-awned rices are peculiar to subtropical and tropical crops, while coarsely rough-awned rices must be characteristic of the crops in dry continental climates of Asia, of Central Asia in particular.

Rice culture in the Amur Province of Asiatic Russia [trans. title], M. E. PANCHENKO (*Trudy Prikl. Bot. i Selek. (Bul. Appl. Bot. and Plant-Breeding), 14 (1924–25), No. 1, pp. 140–164, fig. 1*).—Practices involved in rice culture in the Amur Province are described briefly with historical notes. Experiments

in several localities gave information concerning varieties, soils, seasonal and cultural requirements, and the geographical limitations of the crop.

Sweet clover, C. R. MEGEE (*Michigan Sta. Spec. Bul. 152 (1926), pp. 16, figs. 8*).—The worth of sweet clover for pasture, as a high protein hay, in rotations, and in soil improvement is pointed out, and cultural and harvest practices are indicated for hay and seed production.

Winter wheat investigations, T. A. KIESSELBACH (*Nebraska Sta. Research Bul. 31 (1925), pp. 5–149, figs. 30*).—Breeding work with wheat during 20 years, largely isolation and testing of pure lines of Turkey, is reported upon; the effects of a number of cultural practices related to the preparation of seed, seeding, treatment of growing crop, and harvesting are presented; and the experimental technique of the comparative trials is described. Comparative tests involving selected Turkey strains, other Nebraska varieties, and varieties from other States, and strains pure v. in mixtures, and comparative milling and baking tests of Nebraska Turkey strains and varieties are also discussed. Comment is made on the merits of Marvelous (Fulcaster) wheat, on an exceptional hybrid between Turkey and Big Frame wheat, on the reaction of varieties to leaf rust and stem rust, on the effectiveness of different seed treatments in smut control, and on the comparative yields of wheat, rye, and other cereals.

Nothing seemed to be gained by continued selection within a pure line. The strain tests indicated that experimental error and seasonal effects may cause strains to rank widely different in different years and that several years' trials are usually needed for dependable comparative results. The most productive strain grown pure seemed more profitable than a mixture of high-yielding strains.

A group of hard red winter varieties averaged 6.5 bu. higher in yield than a group of soft red winter varieties, but was only slightly superior in milling and baking value. The total protein content of a variety and its baking value were not closely correlated. The crude-protein percentage in wheat grown in different years did not appear to be indicative of the baking strength of the flour produced. Tests of Kanred and Nebraska No. 60 (Turkey) grown at eight planting dates during each of three years indicated no pronounced correlation between protein content and baking value. Delayed planting reduced grain yields without a compensating increase in baking value. Harvesting before full maturity in the early and late dough stages failed to increase the protein content of the grain or to give consistently superior milling and baking results. Early seed-bed preparation proved advantageous in both baking strength and grain yield. Quadrennial 8-ton manure applications failed to affect the milling and baking qualities of Turkey wheat materially, but increased the grain yield. Considering yield and milling and baking value, Kanred and Nebraska No. 6 and No. 60 seem about equal under average eastern Nebraska conditions. On the basis of yield alone, Kanred has a slight advantage.

Judging from yields and from plant characteristics, no heritable change evidently took place as a result of continuous planting at rates of 3, 5, and 8 pk. per acre. Comparisons of different sizes, weights, and fanning-mill grades of seed have been noted (E. S. R., 52, p. 731). The maximum grain yield, obtained by seeding Nebraska No. 60 September 22, gradually reduced to a complete failure with seven succeeding planting dates extending through to early spring. Hessian fly was not serious during these tests. The reduced yield from delayed planting was accompanied by gradual reduction in bushel weight and an increase in protein content. Similar results were observed with Kanred. A wide range in seeding rate of Turkey wheat was feasible without

a correspondingly marked effect upon yield. Both 8- and 4-in. drills outyielded broadcasted wheat. Increased yields did not result from spring rolling or from harrowing.

Pasturing or mowing Turkey wheat in the spring (during April) increased the grain yields and reduced lodging somewhat. In years without lodging, pasturing reduced the yields 32 per cent. Pasturing or mowing too close to the ground resulted in decided decreases in yield, probably due to injury to the developing spike, and also in a thinning of stand, reduction in mature height and straw weight, and delay in maturity. Removal of the leaf blades 3, 10, and 17 days after heading in Turkey wheat which had a normal fruiting period of 28 days gave acre yields of 28.6, 32.4, and 35.4 bu., respectively, compared with 36.9 bu. from unstripped wheat.

The maximum moisture-free kernel weight was attained from 2 to 4 days before dead ripening, when the grain held an average of 30 per cent moisture. About 0.5 per cent of substance appeared to be lost in curing. Analysis of the wheat grain harvested in 2-day intervals showed a rather continued lowering in the percentage of ash, ether extract, and crude fiber throughout the kernel development. The protein percentage declined quite regularly until 4 or 6 days before maturity, when it gradually increased from 1 to 2 per cent by maturity. The nitrogen-free extract increased until 6 or 8 days before maturity, after which it dropped about 1 per cent by maturity. Turkey wheat harvested when ripe made higher yields than at earlier stages, the average relative kernel weights corresponding closely to relative acre grain yields. During 21 years Turkey wheat has taken an average of 31 days to ripen after coming into full head.

From the comparative behavior of different strains and varieties of winter wheat and from field observations, winter killing in Nebraska seems usually due either to excessive cold or to drying out as a result of drought. Kanred and Nebraska No. 60 have both proved somewhat hardier than common Turkey, and in this regard several other productive selections and varieties fully equal and may excel common Turkey.

A histological leaf study of wheat, acclimated to various sources, gave no consistent evidence of the inheritance of histological modifications induced by the environment.

Comparison of field and nursery results indicates that when nursery methods correspond closely with those of field plats the nursery may be expected to give fair indications of relative behavior in the field. Inadequate replication, plat competition, and short duration of the tests are outstanding causes of inaccuracy in comparative results. Less accurate methods are permissible for preliminary testing and elimination of unpromising sorts than where accurate comparative yields are sought.

Early wheats of Eastern Siberia [trans. title], V. E. PISAREV (*Trudy Prikl. Bot. i Selek.* (*Bul. Appl. Bot. and Plant-Breeding*), *14* (*1924–25*), *No. 1, pp. 112, 135*).—*Triticum vulgare ferrugineum sibiricum* was the prevailing botanical variety among very early forms of spring wheat found in Eastern Siberia. Corresponding forms of the varieties *erythrospermum*, *lutescens*, and *milturum* were also noted. Trials in Eastern Siberia, at Leningrad, and by the Alaska Experiment Stations showed these sorts to be characterized by early maturity, small kernels, short culms, and low heat requirement.

The wheats of Khoresm (Khiva) [trans. title], K. FLIAKSBERGER (C. A. FLAKSBERGER) (*Trudy Prikl. Bot. i Selek.* (*Bul. Appl. Bot. and Plant-Breeding*), *14* (*1924–25*), *No. 1, pp. 3–25, pl. 1, figs. 3*).—Included among Khiva wheats were found *Triticum vulgare graecum* and *T. vulgare alborubrum* and other vulgare forms, and *T. compactum fetisowi*, *T. compactum rubriceps*, and *T.*

compactum echinodes. The culture of club wheats and the absence of durum wheats suggest that the wheats of Khiva came from Bokhara and not Turkestan.

Correlation of test weight per bushel of hard spring wheat with flour yield and other factors of quality, C. E. MANGELS and T. SANDERSON (*Cereal Chem., 2 (1925), No. 6, pp. 365–369*).—Correlation studies made at the North Dakota Experiment Station, using data on hard red spring wheat (E. S. R., 53, pp. 838, 839) from the crops of 1916 and 1919 to 1924, inclusive, showed a high positive correlation between test weight and flour yield and a lesser correlation, varying with different crops, between test weight and color score of head. Significant correlations were not observed between test weight and loaf volumne of water absorption of flour.

The medal of gold, W. C. EDGAR (*Minneapolis, Minn.: Bellman Co., 1925, pp. VII+373, figs. 64*).—This is a history of the Washburn Crosby Co., flour millers.

Commercial agricultural seeds, 1925, J. M. BARTLETT ET AL. (*Maine Sta. Off. Insp. 118 (1925), pp. 54–69*).—The purity, germination, and weed seed content are tabulated for 195 official samples of agricultural seed collected from dealers in Maine during 1925.

The weed seed content of flaxseed in the western Tien Shan, Tashkent district [trans. title], G. A. BALABAEV (*Trudy Prikl. Bot. i Selek.* (*Bul. Appl. Bot. and Plant-Breeding*), *14 (1924–25), No. 1, pp. 293–358, figs. 7*).—Analyses of samples of flaxseed from six localities at different altitudes near Tashkent, Turkestan, revealed impurities amounting to as high as 50 per cent by weight, much of this being soil. Weeds characteristic of flax seedings and whose seeds were most frequent in the samples were *Vaccaria parviflora*, *Eruca sativa*, *Brassica arvensis*, *Chenopodium* spp., *Lolium remotum*, *Setaria viridis*, *Plantago lanceolata*, and *Sideritis montana*. A definite regularity seems to exist in the distribution of weed seed among flaxseed. The character of this distribution, according to the vertical zones of the mountains, is determined by the biological peculiarities of the weeds as well as by their response to heat and moisture.

Triticum monococcum as an admixture to cereal crops in the Crimea [trans. title], E. BARULINA (*Trudy Prikl. Bot. i Selek* (*Bul. Appl. Bot. and Plant-Breeding*), *14 (1924–25), No. 1, pp. 136–139*).—Pure crops of *T. monococcum cereale* were not observed during a survey in the Crimea, this cereal generally appearing as an impurity of other grain crops. *T. monococcum aegilopoides*, seldom encountered in crops, usually grows along roadsides, field horders, and other uncultivated lands.

HORTICULTURE

[Horticultural investigations at the Georgia Station] (*Georgia Sta. Rpt. 1925, pp. 100–103, 105*).—This is the usual progress report (E. S. R., 53, p. 239).

In small fruit tests the Van Fleet raspberry and Himalaya blackberry were the most prolific varieties. The Van Fleet, however, had an unfortunate tendency to drop its fruit upon maturity. Nitrogen fertilizers increased the set of fruit on peach trees, but the size of the individual fruits was in inverse ratio to the number of peaches upon the tree. Observations upon the effect of fertilizers on the storage quality of peaches showed decided differences in fruits from the differently treated plats.

In connection with a study of the cause of the premature dropping of pecans, it was found that in two trees of the Teche variety only a little more than 3 per cent of the original crop attained maturity. Negative results were ob-

tained by treating pecans with nutritive solutions prior to planting, with a view to increasing the vigor of the seedlings. Some benefit resulted from storing the nuts at a low temperature during the interim between harvest and planting. A long-continued drought in the summer of 1925 was instrumental in reducing the size and hastening the maturity of bush and tree fruits.

[Horticultural investigations by the Ohio Station] (*Ohio Sta. Bul. 392 (1926), pp. 43, 44, 45–47, 51, 83, 84, 85, 86, 87*).—A comparison of grass-mulch and tillage cover crop systems of soil management in apple orchards at Wooster, and in Washington, Clermont, Belmont, and Hamilton Counties has shown tillage to be somewhat superior in respect to growth and yield. However, the grass-mulch treatment was less expensive, and when supplemented with applications of nitrogenous fertilizers was highly effective.

Fertilizer investigations in a peach orchard at Danbury gave evidence that sizable applications of nitrogen in any form increase yield, and at the same time vigor and resistance to unfavorable conditions. No measurable difference was noted between nitrate of soda and ammonium sulfate, or between whole and divided applications. Organic nitrogen, such as tankage and bone meal, were not equal to nitrate of soda or ammonium sulfate. Nitrogenous fertilizers slightly delayed maturity.

Approximately 50 of the many apple seedlings sent in to the station since 1912 for testing fruited during the year and were carefully described.

Pollination tests in 1924 with plums showed the European and damson group to be largely self-fertile and the native, Japanese, and hybrid forms generally self-sterile. Lambert, Bing, and Napoleon sweet cherries were not only self-sterile, but also intersterile. Sour cherries were self-fertile, and when blooming concurrently with sweet cherries were satisfactory pollinizers for the latter. Contrary to the current opinion, fall applications of quickly available nitrogen to apple and peach trees were nearly as effective as spring applications.

With the Adam Early variety of sweet corn the maximum yield was obtained from plants grown in 30-in. rows, with two plants every 15 in. Cabbage fertilizer studies in Mahoning County showed the value of limestone and liberal fertilizing for this crop. At Marietta limestone was of distinct benefit to truck crops.

On the Clermont County Farm nitrogenous fertilizers gave very striking results in the apple orchard. Sulfate of ammonia was significantly more effective than nitrate of soda, while in the Hamilton County Farm orchard the reverse was true.

Insecticides and fungicides, 1925, J. M. Bartlett et al. (*Maine Sta. Off. Insp. 118 (1925), pp. 70–72*).—Herein, as usual (E. S. R., 53, p. 539), are presented the results of analyses of samples received in 1925 from the State commissioner of agriculture.

Cabbage fertilizers, H. H. Zimmerley and M. M. Parker (*Virginia Truck Sta. Bul. 50 (1925), pp. 367–378*).—Investigations conducted from 1922 to 1924 to determine the relative value of various nitrogen sources in complete fertilizers for the early cabbage crop and the effect of time of application showed that a combination of nitrate of soda and ammonium sulfate gives higher yields than does either material alone. Tankage in combination with nitrate of soda, or with both nitrate of soda and ammonium sulfate, gave excellent results. Tankage with ammonium sulfate alone resulted in slow growth, late heading, and relatively low yields. With reference to the time of application, one or two applications in early spring gave significantly better results than did more frequent, divided treatments. Combinations suitable for heavy and light soils are suggested, with the recommendation that one-half the fertilizer be applied

on the south side of the row in early March and the remainder on the north side as soon as the protecting soil ridge is leveled by cultivation.

Cucumber culture, G. E. Starr (*Michigan Sta. Circ. 90 (1926), pp. 3–11*).—Practical information is offered concerning soil, culture, fertilizer, varieties, disease and insect control, harvesting, etc.

Culture of greenhouse lettuce, J. W. Crist (*Michigan Sta. Circ. 89 (1926), pp. 3–6*).—Fertility studies with Grand Rapids Forcing lettuce indicate that well-rotted stable manure is the best source of nutrients for this vegetable. However, in the absence of sufficient manure satisfactory results were secured by supplementing the manure with light applications of complete fertilizers heavy in phosphorus and nitrogen. In a greenhouse at Grand Rapids manure applied at the rate of 20 tons per acre was found superior, particularly in its residual effect on the second crop, to either 1,500, 3,000, or 4,500 lbs. of 4–8–4 fertilizer. There was some indication that the larger sized applications of fertilizer were detrimental. In a test at East Lansing, both acid phosphate and nitrate of soda exerted a beneficial effect on the yields. No increase, but rather a decrease, resulted from the use of potassium and sulfur. As outlined in a previously noted publication (E. S. R., 54, p. 338), applications of lime did not benefit Grand Rapids lettuce, and in the case of large-sized doses exerted a harmful effect, leading the author to suggest that acidity is not harmful provided the soil is fertile and in good physical condition.

Leading commercial varieties of canning peas, E. J. Delwiche and E. J. Renard (*Wisconsin Sta. Bul. 382 (1926), pp. 18, figs. 12*).—Twelve varieties of garden peas, namely, Alaska, Rice No. 330, Roger Winner, Gregory Surprise, Horsford, Advancer, Perfection, Little Gem, Allan Canner, Green Admiral, common Admiral, and Horal, found especially valuable for canning purposes in Wisconsin, are illustrated and described. The Horal, of Wisconsin Station origin, is deemed especially valuable on account of the resistance of the plant to root rot, small size of the peas, uniformity of maturity, etc.

Some tests in the culture of peppers, J. W. Lloyd (*Illinois Sta. Bul. 274 (1926), pp. 330–336, figs. 2*).—Studies with six varieties of garden peppers showed that on a fertile brown silt loam such as was utilized in the test the use of neither nitrate of soda nor bone meal resulted in any consistent benefit in yields. In three of five years, irrigation increased yields so that the average for the 5-year period was 15 per cent. Of the several varieties, Neapolitan Salad was the earliest, Sweet Mountain the heaviest, and Chinese Giant the poorest yielder. Comparing irrigated and nonirrigated lots, both treated with nitrate of soda, it was observed that the combination of irrigation and nitrate of soda was detrimental.

Some new or noteworthy fruits, U. P. Hedrick (*New York State Sta. Circ. 83 (1926), pp. 19*).—The information herein presented has been previously noted in other publications (E. S. R., 52, p. 46), which are no longer available.

Dependable fruits, J. H. Gourley and C. W. Ellenwood (*Ohio Sta. Bul. 394 (1926), pp. 28–59, figs. 6*).—Based upon extensive variety tests in progress at the station, there are presented, together with brief comments, lists of tree, bush, and other fruits which have proved valuable and are recommended for general use.

Eighty winters in Michigan orchards, F. C. Bradford and H. A. Cardinell (*Michigan Sta. Spec. Bul. 149 (1926), pp. 3–103, pls. 8*).—Based upon an exhaustive study of the literature, including available weather records, the authors analyze the relation of winter adversities to Michigan fruit culture during a period of 80 years. No evidence was found to indicate any general

climatic change during this period. Intense cold was not necessarily a cause of winter injury, but when combined with either unusually heavy autumn rainfall or long drought was a potential source of damage. Lack of maturity in the wood is deemed the greatest factor in inducing winter injury, and in this connection prolonged cultivation and heavy manuring have proved unwise practices.

A study of localities and sites indicated that the position of the orchard is important. Low-lying, moist sites delay the maturity of the wood and favor injury. Wind-swept areas from which the snow is blown are also poor sites. Cover crops are deemed beneficial because of their protection to the tree roots rather than as inhibitors of late tree growth.

In respect to species, pears have reacted much like tender varieties of apples. Dwarf pears have suffered severely because of the inherent tenderness of their quince roots. The peach has suffered much more severely than the apple and other fruits from outright root killing. Sour cherries, normally considered hardy, were injured largely because of the results of defoliation from leaf spot. The existence of orchards in Michigan 80 years old and still profitable indicates that winter injury is not an insurmountable difficulty.

Orchard crowding, its effects and remedies, O. M. Morris and W. A. Luce (*Washington Col. Sta. Bul. 200 (1926), pp. 5–34, figs. 6*).—Pointing out that trees in the closely planted apple orchards of Washington are suffering badly from crowding, which results not only in a shading of the lower limbs but greatly accelerates undesirable vertical growth, the authors discuss the effects of this crowded condition on fruit production and suggest methods and plans for thinning crowded orchards. Observations showed that heading in of the side limbs of crowded trees tends to force growth in the top of the trees, and always results in a severe reduction in the quantity of fruit produced. Apples produced on the lower limbs of crowded trees are inferior in color and must be placed in lower grades.

Records of the number of fruit spurs per linear foot upon horizontal and vertical limbs of Rome, Jonathan, and Esopus trees showed a much larger count upon the horizontal branches. Performance records taken on spurs on crowded and uncrowded trees showed that in the Jonathan and Rome varieties the spurs were especially sensitive to shade, while under a similar condition Delicious and Winesap spurs were not seriously affected, probably because of the different habits of growth.

Dividing Jonathan trees into three horizontal zones according to the height above ground and grading the fruit of each zone according to color, there were found 24, 46, and 79 per cent of extra fancy apples in the three zones, respectively, on open Jonathan trees as compared with 3, 16, and 68 per cent for crowded trees. In an orchard with trees crowded in the row but with abundant space between rows, much more fancy fruit was produced on the exposed portions of the trees. The Stayman variety was found particularly susceptible to a loss of color from crowding. Following the removal of crowding trees in a Jonathan orchard, counts showed a much higher percentage of extra fancy fruits than in the preceding year and, furthermore, a much greater proportion of the apples was produced in the lower part of the tree.

Orchard spraying, L. M. Peairs and E. C. Sherwood (*West Virginia Sta. Circ. 36, Sup. (1926), pp. 4*).—Published as a supplement to Circular 36 (E. S. R., 51, p. 240), this brief pamphlet presents an apple spraying program for the Cumberland-Shenandoah Valley region for the season 1926. The recommendations are offered with the approval of the entomologists and plant pathologists of the West Virginia, Virginia, Maryland, and Pennsylvania Stations.

Spraying and dusting experiments with apples in 1925, P. J. Parrott, H. Glasgow, and F. C. Stewart (*New York State Sta. Circ. 84 (1926), pp. 11*).—With the data presented largely in tabular form, this report, the fourth in the series (E. S. R., 54, p. 539), presents a brief summary of the results secured in 1925 in insect and fungus control experiments in apple orchards at North Rose, Geneva, and Hall.

Apple pruning investigations, W. G. Brierley (*Minnesota Sta. Bul. 225 (1925), pp. 22, figs. 16*).—That dormant pruning of apple trees may be successfully performed at any convenient time from November to April was indicated in records taken upon the growth of shoots of trees pruned each month from November to June. Trees pruned in May and June, except where pruning operations were confined to thinning, suffered a sharp reduction in the length and diameter of the new shoots. A comparison of late fall and early spring pruning in four commercial orchards showed practically no differences as measured in the vigor and the growth of the trees. On vigorous trees pruning wounds healed satisfactorily whether of fall or spring origin, and conversely healing was slow in wounds on weak trees irrespective of the season of making, leading to the conclusion that the rate of healing is more closely correlated with vigor than with season.

Studies with trees at the University Farm and in a neglected commercial orchard in Washington County showed that apple trees of bearing age may be renovated successfully by pruning. This treatment should, however, consist of the removal of smaller branches rather than large scaffold limbs, as severely pruned trees were reduced in their producing capacity and the large wounds were found to be a potential source of decay.

An examination of over 2,000 pruning wounds in various orchards showed that failure to heal properly is generally associated with poor pruning, and that the rate of healing was directly associated with the vigor of the tree, suggesting that pruning should be closely correlated with other orchard management practices, such as fertilizing, spraying, and tillage.

The respiration of Bartlett pears, J. R. Magness and W. S Ballard (*Jour. Agr. Research [U. S.], 32 (1926), No. 9, pp. 801–832, figs. 5*).—Measurements of the carbon dioxide evolved by California-grown Bartlett pears harvested at different stages of maturity and stored at different temperatures showed that the carbon dioxide output increases markedly from the time of picking to full maturity, and is apparently an accurate means of measuring the ripening processes. In fruit from a single tree, early picked pears respired at a lower initial rate, and this rate was accelerated less rapidly than in late picked pears. Early picked fruit respired more rapidly when soft ripe, and began to break down more quickly than did late picked fruit from the same tree. Pears grown in regions producing fruit of poor carrying quality had a high initial and a more rapidly increasing carbon dioxide output than did those grown in a more favorable locality. At 30° F. there was no acceleration and at 37° a slight acceleration in the rate of carbon dioxide evolution during periods of four months and of one month in storage, respectively. Fruit ripened approximately twice as fast at 37° as at 30°.

As measured by the amount of oxygen given off by a given weight of pear flesh in a measured quantity of hydrogen peroxide, there was found an increase in catalase activity in Bartlett pears as they are held in storage, followed by a decrease as they approach eating condition. Catalase decrease was apparent much sooner than was the decrease in carbon dioxide output. At low temperatures, 28 and 33°, there was an apparent increase in catalase content for a short time after picking.

Determinations of the composition of gases in the intercellular spaces within the pear showed that the concentration of carbon dioxide was higher and that of oxygen lower in pears held in the vicinity of 60° than at lower temperatures. As the fruit matured at 60° there was a sharp increase in carbon dioxide content and an increase in oxygen, with the temperature of the fruit remaining constant.

Commercial fertilizers for grapes, F. E. GLADWIN (*New York State Sta. Circ. 85 (1926), pp. 11*).—This circular summarizes information presented in an earlier noted publication (E. S. R., 41, p. 341), now out of print.

Coloring citrus fruit in Florida, W. R. BARGER and L. A. HAWKINS (*U. S. Dept. Agr. Bul. 1367 (1926), pp. 20, figs. 11*).—Following a general discussion upon the present status of experimental investigations in the acceleration of yellowing of citrus fruits by means of gases, the authors present the results of work with Florida grapefruit and oranges.

Grapefruits showing sufficient yellow color to be described as from 10 to 20 per cent colored attained a satisfactory market color in from 18 to 36 hours, while early varieties of oranges just beginning to show yellow required from 48 to 72 hours. Late Valencia oranges were slower to color, requiring approximately from 70 to 96 hours at a temperature of 90° F. and a relative humidity of 85 per cent. Fruits showing no yellow color took considerably longer to reach a full golden yellow than those showing some yellow through the green.

The temperature in the coloring chamber was found to be a very important factor in effecting change. Above 90° fruits were liable to become spotted or scalded. At 90°, with a humidity of from 85 to 90 per cent, grapefruits dropped their stems, a desirable feature in respect to disease control but not in respect to market demands. Since fruits color more rapidly at higher temperatures, from 80 to 85° is recommended as the desirable temperature, accompanied by a humidity of from 80 to 90 per cent to prevent shrinkage. Since coloring exerts practically no change in the composition of the fruit, the authors advise that only such fruit as has reached the market standard of maturity be utilized in coloring operations.

Information is presented on the construction, arrangement, and operation of coloring plants.

[Pineapple studies at the Guam Station], J. GUERRERO (*Guam Sta. Rpt. 1924, p. 13*).—The completion of fertility studies with pineapples (E. S. R., 53, p. 436) gave evidence that fertilizers are valuable for this plant, treated plats of the Smooth Cayenne and Thorny Red varieties yielding 77.8 and 87.8 per cent greater yields, respectively, than control areas. In general, ammonium sulfate produced the largest fruits in both varieties and in the case of Thorny Red gave higher yields than did nitrate of soda.

Peppermint growing in Michigan, J. R. DUNCAN (*Michigan Sta. Spec. Bul. 153 (1926), pp. 3–11, figs. 5*).—In this general discussion there are considered the various phases of peppermint production—soil selection and preparation, propagation, planting, harvesting, distilling, economic considerations, etc.

Garden flowers, A. LAURIE (*Michigan Sta. Circ. 92 (1926), pp. 3–19, figs. 23*).—This contains brief cultural and varietal notes upon some of the better known annual and perennial garden flowers.

Pansies from seed, C. H. CONNORS (*New Jersey Stas. Circ. 185 (1926), pp. 4, fig. 1*).—Stressing the importance of using only the best quality of seed, the author briefly discusses the cultural requirements of the pansy.

Peonies in the garden, C. H. CONNORS (*New Jersey Stas. Circ. 184 (1926), pp. 8, fig. 1*).—Information is presented upon the cultural requirements, varieties, causes of nonblossoming, pests and their control, etc.

FORESTRY

What the national forests mean to Montana, K. D. SWAN (*U. S. Dept. Agr., Misc. Circ. 48 (1926), pp. II+28, figs. 21*).—The 17 national forests in Montana, embracing nearly 16,000,000 acres, are considered of great value to the State, not only as a source of timber but also of water for irrigation, manufacture of electricity, and other urban needs. Large numbers of domestic animals are grazed within the national forests, wild animals are protected, and recreation opportunities offered. The protective and planting activities of the Forest Service in keeping the forests productive are discussed.

[Forestry investigations at the Ohio Station] (*Ohio Sta. Bul. 392 (1926), pp. 4, 71–79, figs. 5*).—Legislation enacted by the Eighty-sixth General Assembly provided for the taxation of forest lands on the basis of the timber crop rather than upon the present annual tax. During the year a total of over 400,000 trees were distributed for planting. Observations upon forest growth in run-down, old fields in southern Ohio indicated that desirable species of hardwood can not compete with pines on such locations. Records taken in the Waterloo State Forest in Athens County showed red oak to have made only one-fourth the height growth of pines, and at the same time the survival in the oaks was only 35 per cent as compared with 99 per cent for the pines. A total of 2,992 acres were added to the State forests during the year. Forest fires burned over areas totaling 26,695 acres.

Dry weather injury to trees (*Georgia Sta. Rpt. 1925, pp. 102, 103, 104, 105, fig 1*).—Observations made during an unusually prolonged drought in the summer of 1925 showed that the presence of accumulated leaves and litter did not prevent drought injury. On low sites, ordinarily swampy, injury was very severe, more so than on hillsides. The age of the trees had no significant effect on the death rate. Cultivated trees suffered injury but were less inclined to die than untilled trees. A list showing the relative susceptibility of various species is given. The white oak was very resistant, while the maples, black oaks, dogwood, and hickories were nonresistant.

The determination of increment in cut-over stands of western yellow pine in Arizona, H. KRAUCH (*Jour. Agr. Research [U. S.], 32 (1926), No. 6, pp. 501–541, figs. 20*).—A study of a number of permanent sample plats established in cut-over stands of western yellow pine showed the impossibility of applying data obtained from small sample plats to more extensive areas directly upon the acre basis because of differences in the degree of stocking and the distribution of diameter classes. Hence a method was devised in which the tree rather than the area was used as a unit of measurement. With this method a limited number of trees covering the conditions of site, age, vigor, and crown class were measured for height and diameter growth and the data then applied to a stand table previously determined from a survey of extensive blocks or strips.

This individual tree method of determining increment has four distinct advantages over the area method, namely, (1) adaptability to unevenly stocked stands, (2) economy of operation, since a much smaller percentage of the trees are involved, (3) the repeated taking of records on the same trees, thus showing which diameter classes are making the greatest diameter increment, and (4) the analysis of growth on the basis of age, vigor, and crown development of the trees.

In applying this method of analysis it was found that the increment of average trees varied directly with the age, vigor, and effective crown areas. In the yellow pine, with the exception of trees having thrifty, well-developed

crowns, growth increment slowed down in the higher diameter classes. The effect of lack of vigor in retarding growth was most pronounced in young trees. Since the distribution of diameter classes was much more irregular on small than on large areas, the latter are recommended as more dependable sources of reliable stand data. The greater mortality occurring in the higher diameter classes frequently resulted in net losses instead of increment. It is emphasized that increment percentage is no indicator of volume increment per acre, but must be limited in application to individual diameter classes.

Timber growing and logging practice in the California pine region, S. B. Show (*U. S. Dept. Agr. Bul. 1402 (1926), pp. 76, figs. 24*).—This paper, with an introduction by W. B. Greeley, is one of a series designed to present to the landowners and lumbermen of the 12 principal forest regions of the United States information concerning the essential and the best known forestry practices for their respective areas. The material is presented from two general viewpoints, (1) that of measures necessary to keep forest lands in a productive condition, and (2) measures necessary to produce full timber crops. The first section discusses among other items the need of fire protection in both the standing forest and cut-over lands, methods for the disposal of slash, improved methods of logging and yarding with a view to lessening injury to advance reproduction, and the necessity of leaving an adequate number of seed trees. The second part of the paper deals with measures suggested as a result of experiences gained in managing the various national forests, and is presented with a view to aiding the landowner in developing the maximum productivity of his soil.

A method of preparing timber-yield tables, D. Bruce (*Jour. Agr. Research [U. S.], 32 (1926), No. 6, pp. 543–557, figs. 8*).—Herein are presented details of new methods of technique employed in constructing yield tables utilized in an analysis of data collected in a comprehensive study of growth of four southern pines, namely, longleaf, shortleaf, slash, and loblolly. The tables were found so satisfactory that the methods are deemed of value for other species and other regions. The author justifies the use of anamorphosis in the preparation of curves, on the basis that this method of technique allows the free use of a number of conceptions of modern statistical technique and the careful cross checking of results.

DISEASES OF PLANTS

Check list of diseases of economic plants in the United States, P. J. Anderson, R. J. Haskell, W. C. Muenscher, C. J. Weld, J. I. Wood, and G. H. Martin (*U. S. Dept. Agr. Bul. 1366 (1926), pp. 112, figs. 4*).—A list is given of the important parasitic and nonparasitic diseases known to occur in the United States on economically important plants, including timber trees and many ornamentals. The arrangement is alphabetical of hosts and parasites. In general, the scientific and common names of the hosts are those used in Standardized Plant Names (E. S. R., 53, p. 122), and for the pathogenes the names are those in most common use, except in a few groups where recent monographs are followed.

Diseases and injuries of agricultural plants, O. von Kirchner (*Die Krankheiten und Beschädigungen Unserer Landwirtschaftlichen Kulturpflanzen. Stuttgart: Eugen Ulmer, 1923, 3. ed., rev., pp. VII+679*).—This book, now in its third edition, is intended chiefly as an aid to biologists, agriculturists, and horticulturists.

[Plant disease investigations] (*Georgia Sta. Rpt. 1925, pp. 105–107*).—In 1912, 121 apple trees of 10 varieties were planted to test the effect of crown gall on the length of life of the trees and yield of apples. Certified and infected

trees were planted in alternate rows, and after 10 years' growth 37 trees which were infected with crown gall were alive, and 33 were dead, while 23 of the certified trees were alive, and 30 were dead. The average diameter of the crown gall trees was 14.5 in., and that of the clean trees was 17.2 in. A large number of the trees were infected with diseases other than crown gall so that it was impossible to determine the cause of death in all cases.

In continuation of experiments on the longevity of *Fusarium lycopersicum* in soil, it was found that the fungus persisted for the fourth year in all plats.

Further study of the anthracnose of peppers confirmed previous conclusions that the principal causal agent is *Gloeosporium piperatum*. The physiological spotting of the blossom end of the pepper, previously reported (E. S. R., 53, p. 246), was again prevalent. Peach rosette was observed in the station orchards during the year.

Greenhouse experiments for the control of a damping-off of cotton were very successful, but they failed in field trials, due to severe drought.

[Plant disease investigations in Ohio] (*Ohio Sta. Bul. 392 (1926), pp. 33–41, fig. 1*).—Accounts are given of investigations conducted during the years 1924 and 1925, some of which have been noted from other sources (E. S. R., 53, p. 46; 54, pp. 351, 544, 746).

In addition to the foregoing, studies of apple scab showed the necessity of timely spraying, as the initial infection may take place as soon as the buds open or even before the application of the delayed dormant spray. Heavy spore discharges were observed in 1924 during a rainy period from May 4 to 20.

Experiments are said to indicate that Bordeaux mixture was more effective than lime sulfur for the control of apple blotch. Copper dusts are said to have given some promise of blotch control.

Studies of peach diseases and their control are said to indicate that for summer treatment sulfur dusts may be substituted for liquid sprays.

The black spot of peach and plum caused by *Bacterium pruni* is said to be general throughout the State. Spraying, pruning, and avoiding late cultivation and excessive fertilization are suggested for control measures.

Efforts to develop cabbage resistant to yellows are said to have resulted in a selection of Burpee Early Forcing cabbage that is almost completely resistant.

Botrytis blossom blight and leaf spot of geranium, and its relation to the gray mold of head lettuce, L. E. MELCHERS (*Jour. Agr. Research [U. S.], 32 (1926), No. 9, pp. 883–894, pls. 3*).—In a previous publication (E. S. R., 39, p. 857), the author reported a disease of cultivated geraniums caused by a strain of Botrytis closely resembling *B. cinerea*.

The results of additional studies of this disease are given, in which it is shown that a blighting of the blossoms and spotting of the leaves is due to this organism. It is also found that the same fungus may cause a gray mold disease of head lettuce in the greenhouse.

It is said that under favorable environmental conditions *B. cinerea* may cause considerable damage to susceptible host plants. Careful greenhouse management, including proper watering and ventilation, is reported to hold the disease in check.

Making weather to order for the study of grain diseases, J. G. DICKSON (*Wisconsin Sta. Bul. 379 (1926), pp. 36, figs. 20*).—Studies of the behavior of cereals and their parasitic fungi in the Wisconsin temperature and moisture control apparatus, supplemented with field tests, were made to determine conditions under which plantings can be made with reasonable certainty of escaping some of the important diseases of cereals and flax. Seed treatment and resistant varieties are also suggested as additional control measures.

Cytological studies of Forms 9, 21, and 27 of Puccinia graminis tritici on Khapli emmer, R. F. Allen (*Jour. Agr. Research* [*U. S.*], *32* (*1926*), *No. 8, pp. 701–725, pls. 9*).—The results are given of cytological studies of three physiological forms of wheat stem rust on Khapli emmer, a highly resistant variety, and cultures taken from Little Club wheat, a very susceptible one. The several forms were found to behave quite differently in many respects.

Seed disinfection.—I, Experiments and demonstrations with barley, 1917–1924 [trans. title], E. Gram (*Tidsskr. Planteavl, 31* (*1925*), *No. 1, pp. 27–76*).—Experimentation is reported as directed mainly against barley stripe (*Pleospora graminea*), said to show an increase in importance during recent years. To accomplish 2 or 3 successive tests between harvest and spring, the barley was sown in pots or boxes, these being kept at from 6 to 8° C. (42.8 to 46.4° F.) for 3 weeks, then placed in a hothouse for 6 weeks to determine the stripe infection percentage.

Hot water should be used only when indispensable on account of loose smut (*Ustilago nuda*), as it may lower germinability if the presoak is too long (over 3 hours), if the treatment is too long, if the temperature of the water is too high, or if the grain is not immediately after treatment cooled down to about 14°. Hot air showed no fungicidal value, though air may be used at from 44 to 47° to dry barley seed treated with Germisan or with Tillantin C. Copper sulfate, though liable to injure germination, has proved effective in case of moderately infected barley seed steeped for 4 hours in a 0.5 per cent solution. Formaldehyde requires 6 hours in a solution at 0.2 per cent, is regarded as not entirely reliable, and on account of slow drying is not practical. Mercuric chloride is effective when used to steep seed for from 1 to 2 hours, but it is not practical, as it is poisonous, and sprinkling is not effective. Germisan was very efficient against stripe when used for steeping at 0.5 per cent for 10 minutes, and Tillantin C was effective when used at 0.2 per cent solution. Wheat-fusariol, Uspulun, Segetan, and Kalimat were inefficient against barley stripe, and Solomia was still less effective.

A study of smut resistance in corn seedlings grown in the greenhouse, W. H. Tisdale and C. O. Johnston (*Jour. Agr. Research* [*U. S.*], *32* (*1926*), *No. 7, pp. 649–668, pls. 3*).—A method is described for infecting corn seedlings with *Ustilago zeae* for the purpose of studying varietal and strain resistance to smut. This is said to be of advantage in that samples of corn may be tested before planting and much time saved.

Fresh cultures of *U. zeae* in carrot decoction were found to be a more satisfactory inoculum than chlamydospores or conidia from cultures on solid media. The most effective method of inoculation was the injection of conidial suspensions, although fairly satisfactory results were obtained by dropping the inoculum into the apical buds. Poor results were obtained by spraying. Cultures of smut from some sources proved more effective than others, the most effective individual cultures used being from Idaho and Virginia. High temperatures (80 to 95° F.) were found to favor infection, and sufficient moisture to prevent drying of the inoculum until infection took place was necessary.

Under the conditions of the experiments, corn seedlings were found to be as susceptible as older plants. Plants that showed resistance in the field also showed it in the greenhouse when inoculated during or after the three-leaf stage. Susceptible strains in the field were equally susceptible in the greenhouse. Plants of resistant strains were infected, especially when very young, but they were able to suppress the invasion of the fungus to a certain extent, while susceptible plants were often killed.

Yellow pickle in greenhouse cucumbers, V. A. Tiedjens (*Massachusetts Sta. Bul. 225 (1925), pp. 8*).—Yellow pickle is a name given to prematurely yellowed cucumbers, the condition being brought about by a number of physiological causes. The author claims that any factor that reduces the food supply to the plant may cause a condition favorable to the formation of yellow pickles. Inadequate light, insufficient nitrates, excessive set, surplus water, poor drainage, or a serious attack of animal or plant parasites may all contribute to a premature ripening of cucumbers. The remedy suggested is the prevention, elimination, or correction of those conditions that tend to devitalize the plant.

Saltation in the organism causing "black dot" disease of potato in Canada, B. T. Dickson (*Roy Soc. Canada, Proc. and Trans., 3. ser., 17 (1923), Sect. V, pp. 123–128, pl. 1, figs. 4*).—In a previous report (E. S. R., 48, p. 242) the author noted a potato tuber disease and stem rot in Canada, attributed to *Vermicularia varians*. The present paper notes the occurrence of saltation in culture of this organism. The results of culturing the types are presented in tabular form and are claimed to show that there are two variants or saltants from the original type, though insufficient time (only 10 generations) has as yet elapsed to prove whether mutations actually occur.

Late blight of potatoes, J. G. Coulson (*Jour. Agr. and Hort. [Quebec], 27 (1923), No. 2, pp. 19, 20, fig. 1*).—This brief statement of information, including a table credited to Hardenburg (E. S. R., 48, p. 33), claims careful experimentation in Canada and the United States to show that maximum values are obtained under any set or combination of conditions from crops when thorough and frequent sprayings of potatoes for late blight are carried out from year to year with 4–4–40 Bordeaux mixture under at least 150 lbs. pressure.

Relation of growth in the potato tuber to the potato-scab disease, H. Fellows (*Jour. Agr. Research [U. S.], 32 (1926), No. 8, pp. 757–781, pls. 5, figs. 7*).—A study was made of the relation of growth in the potato tuber to the amount of scab produced by *Actinomyces scabies*.

Inoculation experiments with partially mature plants showed that large tubers were infected at the apical end only and in buds near the apical end. Small tubers were not infected. When the plants were nearly mature small tubers were not infected, medium sized tubers were infected at the apical end only, and the largest tubers were not infected. In all cases where infection took place, the protective covering of the tuber consisted of an epidermis or newly formed cork, in which stomata or young lenticels were being formed. The tubers that did not become infected were protected by cork or a cutinized layer covering the apical end. It is believed that if the potato scab disease is to occur, the tuber must be increasing in size, there must be stomata or young unsuberized lenticels present through which the infection can take place, and there must be dividing cells or cells which can easily be incited to division by the products of the organism, thus permitting the production of the typical corky scab lesions.

Seed treatment for the control of Irish potato scab, H. H. Wedgworth and C. B. Anders (*Mississippi Sta. Circ. 61 (1925), pp. 4, figs. 2*).—Directions are given for the treatment of seed potatoes with corrosive sublimate, and the authors' experiments indicate the successful use of this fungicide for the reduction of scabby potatoes.

Field wilt (Fusarium) of potatoes, H. E. Morris (*Montana Sta. Bul. 184 (1926), pp. 14, figs. 2*).—A description is given of field wilt of potatoes due to *F. oxysporum* or one of its varieties. According to the author's investigations seed disinfection did not control the disease, and the planting of seed of high quality, together with crop rotation, is recommended.

Further studies of potato wilt caused by Verticillium albo-atrum, M. B. McKay (*Jour. Agr. Research [U. S.], 32 (1926), No. 5, pp. 437–470, pls. 7, figs. 5*).—The author reported upon the economic importance of potato wilt due to *V. albo-atrum* in a previous publication (E. S. R., 45, p. 846). Since that time further studies have been made of control measures. The disease is said to be transmitted from crop to crop through the seed tubers, but evidence has been obtained which indicates that the presence or absence of the fungus in potato tubers can not be reliably determined from a mere inspection of the tubers. The separation of tubers with discolored stem ends, or the discarding of stem ends, and the planting of only eye ends can not be recommended as specific measures for control. The fungus has been found to spread from one plant to another in the row during the growing season, but many potato plants contaminated from the adjoining wilt-diseased plants do not show visible wilt symptoms in the field, probably because of late infection. Consequently all wilt-infected plants can not the detected by field inspections.

For control the author claims that, in roguing, the noticeably wilt-diseased plant and the next adjoining healthy appearing plant on either side in the same row should be removed at the same time.

Viability tests conducted showed that *V. albo-atrum* lives readily in old potato tops in the soil from harvest in the fall through one winter to planting time the next season, but it is probably not able to live thus through two winters to the second planting season. This would indicate that planting soil with a nonsusceptible crop for one year would be sufficient to rid it of a contamination by the fungus. However, field trials showed that a two-year rotation was ineffective for avoiding infection from the soil. Three- or four-year rotations are considered completely effective in eliminating the fungus.

Tests of 12 varieties of potatoes did not indicate any appreciable resistance to Verticillium wilt.

Storage dry rot of potatoes, H. E. Morris (*Montana Sta. Bul. 183 (1926), pp. 10, figs. 2*).—A brief description is given of storage dry-rot, which is said to be distinct from Fusarium wilt, although it is caused by a somewhat similar organism.

For the prevention of losses the author recommends careful handling when digging, grading, and storing potatoes; storage in well-ventilated houses at a temperature between 35 and 40° F.; and cleaning and disinfecting the storing house at the end of each season.

Root disease of sugar cane in Louisiana, R. D. Rands (*U. S. Dept. Agr., Dept. Circ. 366 (1926), pp. 20, figs. 6*).—In a previous paper (E. S. R., 52, p. 449) the author reported injury to cane roots by snails. In a later publication Edgerton et al. reported the occurrence in Louisiana of several root-rotting fungi. In the present circular the author describes the symptoms, effects, and predisposing conditions for root disease of sugar cane, the term being adopted for injury by animals and subsequent decaying of the roots. Two species of root-eating centipedes are reported (*Arenophilus bipuncticeps* and *Hanseniella unguiculata*). The latter species is reported for the first time as occurring in the United States.

The symptoms and effects of the sugar cane root rot are described, and attention is called to the damage caused, especially during early stages of the crop.

The author considers that while much of the root rotting is initiated by animal injury, further study is needed to determine the relation of the various factors involved. Soil fumigation with paradichlorobenzene is said to have prevented, at least temporarily, root mutilation and root rot on spring-planted canes.

Root-rot of tobacco in Kentucky and its control, W. D. VALLEAU, R. KENNEY, and E. J. KINNEY (*Kentucky Sta. Bul. 262 (1925), pp. 157–180, figs. 6*).—A preliminary account is given of a study of the distribution of black root rot of tobacco in the Burley section of the State and of the relative resistance of the so-called varieties and selected strains of Burley to the causal organism *Thielavia basicola* (E. S. R., 54, p. 247). Field studies covering a period of five years on the comparative growth of resistant and susceptible strains of tobacco are said to indicate that black root rot is causing extensive injury in 30 per cent of the fields each year and a less amount of injury in from 10 to 20 per cent of other fields. The commonly grown varieties of Burley tobacco were found highly susceptible to black root rot, but resistant strains of both stand-up and drooping types have been found. The resistant Burley selections, while not highly resistant to disease, are sufficiently so that they usually make nearly normal growth in heavily infested soils. They are less resistant than the cigar tobacco variety Kentucky Yellow, and more resistant than the Kentucky dark tobacco varieties. In extensive field trials, the Kentucky resistant selections proved superior to the commonly grown varieties on diseased soil, both in rate of growth and quality.

In addition to black root rot, a disease known as brown root rot is said to sometimes cause irregular stands of tobacco. It is recommended that growers test a resistant strain of tobacco in comparison with their own strain to determine whether or not their soil is infected with black root rot.

The authors state that, following the investigations of McCormick (E. S. R., 54, p. 247), the fungus should be called *Thielaviopsis basicola*.

Report on disease control in West Virginia, N. J. GIDDINGS and A. BERG (*Crop Protect. Digest, 1 (1924), No. 4, pp. 28, 29*).—Continuing earlier work (E. S. R., 52, p. 646), data are tabulated from experimentation at Raymond City, W. Va., employing sprays and dusts for control of black rot, leaf spot, and scab on leaves of Rome apple.

Experiments with dust and spray mixtures in New York apple orchards, P. J. PARROTT (*Crop Protect. Digest, 1 (1924), No. 4, pp. 14–18*).—Among the results of experimentation to obtain information relative to the susceptibility of common apple pests to dusts and sprays, data were obtained also regarding control of apple scab, for which the season was favorable and for which more sprayings than usual were made with differing results. Dust mixtures showed low adhesiveness and usually brief effectiveness, the facts indicating the need for more frequent dustings if used during wet seasons.

Apple scab and apple blotch (*Ohio Sta. Bul. 392 (1926), p. 44*).—Field experiments for the control of apple scab and apple blotch are said to indicate that both diseases can be successfully controlled by much weaker spray mixtures than those usually recommended, provided the spraying is done carefully and thoroughly.

Apple blotch, J. W. ROBERTS and L. PIERCE (*U. S. Dept. Agr., Farmers' Bul. 1479 (1926), pp. II+12, figs. 8*).—A popular description is given of apple blotch, and recommendations are suggested for controlling it.

Notes on the orange rusts of Rubus, E. A. BESSEY (*Mich. Acad. Sci., Arts, and Letters, Papers, 3 (1923), pp. 61–66, fig. 1*).—The author, noting the conclusions of Arthur (E. S. R., 38, p. 454) as following earlier work of Kunkel and also statements criticized by Dodge (E. S. R., 53, p. 854), gives results of his own studies during some years involving spore germinations of orange rust specimens sent in from parts of Michigan. Of interest is the fact that some overlapping of host species occurs for the two species of rust. The author attempts to determine data which can be relied on for sure distinction between the long cycle form (*Gymnoconia interstitialis*) and the short cycle form (*Kunkelia nitens*).

Diseases of grapes in Florida, A. S. RHOADS (*Florida Sta. Bul. 178 (1926), pp. 73–156, figs. 48*).—On account of the rapid development of the grape growing industry in Florida the author has given nontechnical descriptions of the diseases of grapes known to occur in the State or which may ultimately be found there, with suggestions for control. Sections are included on climatic conditions in Florida in relation to those of other grape growing sections, on general management of vineyards, on varieties adapted to Florida, and on preparation and use of fungicides.

Phytophthora bud rot of coconut palms in Porto Rico, C. M. TUCKER (*Jour. Agr. Research [U. S.], 32 (1926), No. 5, pp. 471–498, figs. 20*).—A detailed account is given of an investigation of coconut bud rot, the occurrence of which in Porto Rico has been previously noted (E. S. R., 53, p. 549).

The cause of the disease is reported to be *P. faberi*, but in a note the author states that this species is identical with *P. palmivora*. The symptoms of the disease, characters of the fungus, results of inoculation experiments, and attempts at control are described. In a grove of 440 coconut palms, 62 bud-rotted ones were destroyed, and 6 months later 6 new cases appeared. These trees were destroyed, and during another interval of 6 months no new cases developed. The disease has not been observed on any other species of palm in Porto Rico.

The heart rot of black ash caused by Polyporus hispidus Fr., D. V. BAXTER (*Mich. Acad. Sci., Arts, and Letters, Papers, 3 (1923), pp. 39–50, pls. 7, figs. 2*).—Field observations on black ash (*Fraxinus nigra*) made over Michigan, with other checkings on felled and sectioned trees, show that this heart rot (*P. hispidus*) is common throughout the woodlots of the State. It is said to have been reported also from Kansas, Missouri, Ohio, Pennsylvania, New Jersey, and Florida. Occurrences in Europe are noted. The fungus in Michigan, though epidemic on black ash, has not been found on any other host. The organism is described as to its host relations and development. It was not found to be spreading in connection with the work of carpenter ants, but apparently it may enter through branch stubs or wounds. It causes a partial delignification of the wood elements. Mechanical tests of weakening, though relative even in sound wood, show decided lessening of strength by the invasion. Crowding produces conditions favoring this fungus, but thinnings will not greatly simplify the problem of control. Silvicultural systems suited to half tolerant or intolerant species are recommended.

Chestnut blight in the southern Appalachians, G. F. GRAVATT and R. P. MARSHALL (*U. S. Dept. Agr., Dept. Circ. 370 (1926), pp. 12, pls. 10, figs. 2*).—This circular gives the known distribution of chestnut blight (*Endothia parasitica*). Attention is called to its rapid spread to the West and South, and suggestions are given for the utilization of the chestnut timber.

A pathological survey of the Para rubber tree (Hevea brasiliensis) in the Amazon Valley, J. R. WEIR (*U. S. Dept. Agr. Bul. 1380 (1926), pp. 130, pls. 33*).—An account is given of a survey of the diseases of the Para rubber tree in the Amazon Valley. After a general account of pathological conditions and sanitation the special diseases and physiological disturbances and abnormalities are described. Brief notes are given of fungi associated with prepared rubber, and a list is presented of all the species of fungi, mistletoes, and algae that have been reported on Hevea. An extensive bibliography completes the bulletin.

Notes on the failure of the seed crop of Hevea brasiliensis on the east coast of Sumatra, C. D. LA RUE (*Mich. Acad. Sci., Arts, and Letters, Papers, 3 (1923), pp. 193–201*).—The unfinished work reported in this paper was done

in 1919. Para rubber trees on the east coast of Sumatra usually fail to bear as large crops as do those in the Federated Malay States and in Java.

Cultural studies show *Gloeosporium alborubrum* to be associated constantly with the phenomena of fruit and flower loss, causing a rapid rot of young fruits. Since *G. alborubrum* exists in dormant form in many trees, making it difficult to secure plants known to be free from it, conclusive tests have not yet been made. The fungus appears to grow out from its dormant situation in the twigs into the inflorescences, causing abscission of flowers and of fruits. Primary infection of inflorescences may also occur, this phase being controllable by spraying, but only in experimental gardens. The disease occurs on some trees in full vigor. Only areas free from Gloeosporium leaf-fall disease give full seed crops.

Cultural criteria for the distinction of wood-destroying fungi, C. W. Fritz (*Roy. Soc. Canada, Proc. and Trans., 3. ser., 17 (1923), Sect. V, pp. 191–288, pls. 12*).—The main portions of this work include a review, historically treated, of organisms studied in nature and in culture, and sections on species and diagnosis, growth conditions, growth on different media, descriptions of species investigated, identification, host influence upon characters, secondary spore forms, and sporophore production.

With a view to supplementing field methods, an attempt has been made to elaborate a system of laboratory cultural diagnosis. Such a system has been found to be workable, the results often confirming and extending conclusions from field observations. The results and applications of this method are indicated in detail.

ECONOMIC ZOOLOGY—ENTOMOLOGY

An anatomic study of Zonitoides arboreus Say, P. Bartsch and M. E. Quick (*Jour. Agr. Research [U. S.], 32 (1926), No. 8, pp. 783–791, pls. 4*).—The finding by Rands that a small mollusk plays an important rôle in the sugar-cane root disease in Louisiana (E. S. R., 52, p. 449) led to the study here reported.

Z. arboreus is widely distributed, extending over practically all of North America. It is most frequently found under loose, moist bark of decaying trees, although any decaying wood or vegetable detritus seems to serve as a suitable place of abode. Though probably largely nocturnal in its habits, it may be found moving about in the open in wet weather or on moist cloudy days during the warm part of the year. Sometimes the snails climb to considerable heights on the trunks of trees or ledges of rock, where they feed, largely on mycelial threads of fungi. The eggs are deposited under dead, more or less moist bark, or similar situations, sometimes singly and at other times as small clumps, when they are more or less agglutinated. In a comparison of specimens taken from under decaying bark of dead wood at Washington, D. C., and Houma, La., and from earthworm burrows about the roots of sugar cane at Houma, no differences in shell characters or in the structure of the digestive system, radula, reproductive system, or of the central nervous system were detected. This leads the authors to conclude that the organism now held responsible for much of the pitting and mutilation of sugar cane roots in Louisiana, despite the unusual mode of feeding and assumed habitat, is the typical *Z. arboreus*.

[Insect pests in Guam], C. W. Edwards (*Guam Sta. Rpt. 1924, pp. 1, 2, figs. 2*).—A brief reference is made to the coconut scale (*Aspidiotus destructor*) and control work under way, and to a leafhopper (*Megamelus* sp.) and the

Egyptian cotton worm (*Prodenia litura*), which together practically ruined the crop of taro.

[Work in entomology by the Ohio Station] (*Ohio Sta. Bul. 392 (1926), pp. 41–43*).—In work with the corn borer, 14 varieties of corn were tested for resistance to damage and to establish a planting date at which the minimum of infestation occurs, and promising, though not conclusive, results were obtained. Reference is made to an apparatus being devised which, when attached to corn binders, enables corn to be cut within 1 or 2 in. of the ground, thus causing the destruction of numerous corn borers that would otherwise escape.

In studies of the Mexican bean beetle, it was found that the tick trefoil, *Meibomia canescens*, serves as a wild host for all stages. Other wild legumes are attacked to a less extent. New insecticides tried were not so effective as the dusts recommended by Miller (E. S. R., 52, p. 757).

Five years' continuous use of Scalecide at standard dormant strength for control of the San Jose scale and European red mite caused no apparent injury to healthy bearing apple trees. Dry lime sulfur, as in former tests, gave satisfactory control of scale, but did not control red mite. The latter was destroyed by application of oil sprays at strengths recommended for scale control, except in engine-oil emulsion which requires a strength of 3 per cent instead of 2 per cent emulsion. The year's work indicates that conifers are tolerant to a surprising degree to applications of standard strength dormant sprays in the spring before growth starts.

Insect pests of boxwood, C. C. Hamilton (*New Jersey Stas. Circ. 179 (1926), pp. 14, figs. 9*).—This practical summary of information deals with the boxwood leaf miner, boxwood psylla (*Psyllia buxi* L.), oyster-shell scale, and a spider mite (*Paratetranychus yothersii* McG.).

Supplementary investigations of the fluosilicates as insecticides, with observations on the effect of heat and drouth on the Mexican bean beetle, S. Marcovitch (*Tennessee Sta. Bul. 134 (1926), pp. 13*).—This is a report of investigations of the fluosilicates in continuation of those previously noted (E. S. R., 52, p. 555).

"In addition to the commercial sodium fluosilicate, a 'light' and an 'extra light' form are now obtainable in commercial quantities. The extra light, containing about 70 per cent sodium fluosilicate, was effective against some insects and was found to be safe on foliage, except tobacco. A by-product, 'calcium fluosilicate compound,' was marketed the past summer. This product is not readily soluble, is safe on foliage, and effective as an insecticide when applied in heavy doses. It is not as toxic as sodium fluosilicate when used at the same rate.

"The fluosilicates were found especially effective against the striped cucumber beetle [see page 157], blister beetles, and several flea beetles. In laboratory tests cutworms and grasshoppers readily succumbed to a bait composed of 20 parts of bran and 1 part of fluosilicate. Sodium fluosilicate gives promise of becoming a valuable material for the control of bacterial spot of peach (*Bacterium pruni*). Fluosilicate dusts applied to the top of bean plants under cages were found effective against adult Mexican bean beetles. The larvae of the Mexican bean beetle are very susceptible to extremes of heat and drought."

Preventing damage by termites or white ants, T. E. Snyder (*U. S. Dept. Agr., Farmers' Bul. 1472 (1926), pp. II+22, figs. 19*).—This supersedes Farmers' Bulletin 1037, previously noted (E. S. R., 41, p. 355).

The potato leafhopper and how to control it, J. E. Dudley, Jr. (*U. S. Dept. Agr., Farmers' Bul. 1462 (1926), pp. II+13, figs. 10*).—This is a revision

of, and supersedes, Farmers' Bulletin 1225, previously noted (E. S. R., 46, p. 153).

Controlling pear psylla with sprays and dusts (*New York State Sta. Bul. 527, pop. ed. (1926), pp. 15, pls. 4, fig. 1*).—A popular edition of the bulletin by Hartzell previously noted (E. S. R., 54, p. 455).

The pea aphis in California, R. E. CAMPBELL (*Jour. Agr. Research [U. S.], 32 (1926), No. 9, pp. 861–881, figs. 8*).—This is a report of studies, conducted by the U. S. D. A. Bureau of Entomology, of the pea aphid, which has been abundant in many localities on the Pacific coast for a number of years. Much of the data is presented in tabular form.

This aphid was first reported in California in 1883 and had become widely disseminated by 1910. The life history in California is a continuous series of generations of viviparous females. The length of the various stages in the life history, and the total number of young of a female vary inversely with the temperature, while the number of young produced in a day varies directly with the temperature. The pea aphid matures on an average in from 7 to 14 days, according to the season. The reproductive period averages from 14 to 17 days for the year. The yearly average production of young in a day is about 4, and the maximum number produced by 1 female is 176, the average being 68. Winged forms require longer to develop and produce fewer young than wingless forms. Parthenogenetic reproduction continued for 19 months to the forty-fourth generation. Adverse weather conditions may materially check an infestation of the pea aphid. The pea aphid is attacked by several parasitic and predacious enemies and by a fungus disease, but these are ordinarily of little importance in checking an infestation.

The melon aphid (Aphis gossypii Glover), E. M. PATCH (*Maine Sta. Bul. 326 (1925), pp. 185–196, pls. 3*).—This is a summary of information on *A. gossypii*, including data on its seasonal history, food plants, general appearance, names, and control measures. A key to and a list of aphids attacking plants of the gourd family are included (pp. 194–196).

In Maine the melon aphid passes the winter in the egg stage, deposited on orpine or live-forever in September. The eggs hatch in the spring, and the first generations, feeding on the orpine, are wingless females. Wingless females may be found throughout the summer upon these plants. In June winged females appear, which leave the colonies in which they have developed and seek uninfested plants on which to establish new colonies. Each settles on a vigorously growing young leaf of orpine, near the tip of the shoot, and the progeny of the winged female settle among the terminal leaves and on the tender stem of the growing shoot.

Winged forms develop continuously in the colonies on the orpine and disperse to uninfested plants for the establishment of new colonies. Early in the summer the winged aphids seem to prefer to settle on clean and healthy orpine, but those developing later accept other species of plants also. About the time melon, squash, and cucumber plants begin to run they prove attractive to the winged aphids, and the succeeding generations soon colonize the under side of the leaves. Under favorable weather conditions these aphids may become mature when eight days old, and thus within a few weeks the infestation may be very severe.

On the cucurbits, both wingless and winged females develop, the wingless ones being far more numerous until late in the season. As fall approaches the proportion of the winged forms increases, and by the time frost comes there are comparatively few wingless ones remaining on the vines. The winged aphids fly away from the colonies in which they develop and seek fresh vegetation. Under laboratory conditions the winged forms from cucurbits accept

growing orpine plants and probably accept the same vegetation when they are in the open. The colonies established on orpine by the winged females flying from cucurbits contain at first wingless females only. Later winged females are also produced.

All the forms mentioned so far, whether winged or wingless, are viviparous females. No other forms occur on the cucurbits or other secondary food plants. On the primary food plant, the orpine, however, there develop in September wingless egg-laying females. At the same time, on the same plant, the males (also wingless) become mature. Both the egg-laying females and the males are produced by wingless females. The eggs deposited by the females on the orpine do not hatch until the succeeding spring, and so serve as the overwintering stage of this insect. The author points out that it is quite possible that there are localities where this species is carried over from season to season both by the egg stage and by viviparous females.

The common cabbage worm and its control, F. H. Chittenden (*U. S. Dept. Agr., Farmers' Bul. 1461 (1926), pp. II+14, figs. 12*).—This is a revision of, and supersedes, Farmers' Bulletin 766, previously noted (E. S. R., 36, p. 254).

The eastern tent caterpillar, C. C. Hamilton (*New Jersey Stas. Circ. 188 (1926), pp. 8, figs. 6*).—This is a practical summary of information.

Observations on a recurring outbreak of Heterocampa guttivitta Walker and natural enemies controlling it, C. W. Collins (*Jour. Agr. Research [U. S.], 32 (1926), No. 7, pp. 689–699*).—In this contribution the author has attempted to chronicle the important phases of the recurring outbreaks of *H. guttivitta* and to list the enemies that were responsible for its reduction to a minimum in Massachusetts in 1919 and in New Hampshire in 1920, the parasites listed including 2 that attack the eggs, 13 that attack the larvae, and 10 that attack the pupae. At the close of the years mentioned only small numbers of the host were left to hibernate and produce a crop of moths the following years. The enemies most prominent in reducing the numbers and ravages of the host were epidemics of disease, together with starvation among the larvae; the predacious beetle *Calosoma frigidum* Kby.; the egg parasite *Telenomus coelodasidis* Ashm.; and several hymenopterous and dipterous parasites working simultaneously on the larvae and pupae.

"*H. guttivitta*, with its phenomenal outbreaks followed by periods of comparative rarity, presents a most interesting problem in insect parasitism. It has been followed through two serious outbreaks in New Hampshire at 11-year intervals, but definite knowledge of the parasites which were most influential in controlling during the intervening years is limited, owing to the fact that its history could not be followed continuously. If similar conditions prevail in the future as those which governed the outbreak in the period 1917 to 1920 and the period which preceded it, the infestation may be expected to recur in 1928 to 1930."

The corn ear worm on tomato, S. Marcovitch and S. A. Robert (*Tennessee Sta. Bul. 133 (1925), pp. 3–14, figs. 12*).—In three years' trials, corn as a trap crop planted among tomatoes did not give adequate protection against the corn ear worm. On June 21, 1924, a count showed 66 wormy tomatoes in the plat where corn alternated with tomatoes, 19 in the check plat, and 5.8 in the sprayed plat. Good protection was obtained by spraying with lead arsenate.

Studies of the pink bollworm in Mexico, W. Ohlendorf (*U. S. Dept. Agr. Bul. 1374 (1926), pp. 64, figs. 15*).—This is a report of investigations conducted by the Federal Horticultural Board during 1921 and 1922, particularly on a large cotton plantation at Tlahualilo, Durango, in continuation of those of Loftin, McKinney, and Hanson, previously noted (E. S. R., 45, p. 155). The work

is reported under the headings of distribution, habits, damage, food plants, dissemination by flight, natural control, and repression. The studies were aimed particularly at means of control. The author reports an average annual loss of from 20 to 25 per cent of the cotton crop due to the pink boll worm in Mexico since the infestation attained maximum development. There is a reduction in both the quantity of the total crop picked and the quality of the lint and seed marketed.

A physiological study of the growth of the Mediterranean flour moth (Ephestia kuehniella Zeller) in wheat flour, C. H. Richardson (*Jour. Agr. Research* [*U. S.*], *32* (*1926*), *No. 10, pp. 895–929, figs. 13*).—This contribution deals with the subject as follows: Vitamin studies on insects; life history of *E. kuehniella;* food of *E. kuehniella* larvae; experimental methods; growth of larvae in normal entire-wheat flour and in entire-wheat flour extracted with ether, acetone, benzene, petroleum ether, choloroform, carbon tetrachloride, carbon disulfide, and with ethyl alcohol; growth in extracted entire-wheat flour supplemented with fat-soluble vitamin and fats, in highly milled (patent) wheat flour, in flour from degerminated wheat, and in highly milled flour supplemented with various food substances.

The studies have led the author to conclude that *E. kuehniella* larvae grow normally and produce normal-sized moths in flour made from the entire wheat kernel. Ether and choloroform both, evidently, remove a substance or substances from entire-wheat flour which are similar to, or identical with, vitamin A as understood in mammalian nutrition. Egg yolk and butter contain a substance, quite probably vitamin A, which promotes the growth of Ephestia larvae. It seems to be more abundant or more stable in egg yolk than in butterfat. Since the growth value of highly milled wheat flour was considerably improved by the addition of an alcoholic extract of yeast, it is believed that the deficiency of flour for growth lies, at least partly, in its low concentration of vitamin B. The quantity of vitamin B necessary for the growth of Ephestia at a normal rate appears to be contained largely, but not entirely, in the embryo of the wheat kernel.

The European corn borer, C. J. Drake (*Iowa Sta. Circ. 100* (*1926*), *pp. 16, figs. 13*).—A practical summary of information on this pest, which during the summer of 1925 advanced westward in the Lake Erie region to within 35 miles of the Ohio-Indiana State line.

Sting on apples, L. G. Gentner (*Michigan Sta. Circ. 93* (*1926*), *pp. 6, figs. 2*).—The author points out that the so-called sting on apples caused by the codling moth seems to be more prevalent in the southern part of Michigan, especially on the western side along Lake Michigan. It is found in the State at harvest time in two distinct forms, namely, large corked-over spots within depressions and small holes surrounded by dark-colored blotches. These stings are produced by the entrance of codling moth larvae of either the first or second generation, the earlier larvae producing the larger blemishes. Larvae producing stings come mostly from eggs laid on the fruit itself. They die shortly after entering. The blemish appears to occur in proportion to the general infestation in an orchard. However, few stings may be found in unsprayed orchards but there may be much wormy fruit. The proportion of stung fruits is not appreciably reduced by arsenical sprays because, although larvae are eventually killed, they are not killed before they have eaten through the skin. It seems to make little difference in the relative number of stings whether the second codling moth spray is applied 10 days or 2 or 3 weeks after petal fall, or whether or not the number of applications of arsenate of lead are increased. So far as is known, no measures have been worked out, as yet, that will con-

sistently control the sting. To reduce the number of stings it would seem necessary to reduce the total number of codling moths in an orchard or to find some way to destroy the eggs before they hatch.

The codling moth in walnuts, H. J. Quayle (*California Sta. Bul. 402 (1926), pp. 3–33, figs. 11*).—A summary of information on this important pest, which highly infests walnuts in certain limited sections of the walnut-growing area of California, and is found sparingly over a large area. Earlier accounts have been noted (E. S. R., 23, p. 760; 40, p. 456; 41, p. 665). Walnuts are also somewhat infested in France and South Africa (E. S. R., 42 p. 547). The author considers the identity of the species, its life history at Santa Ana, seasonal history at Santa Ana and Carpinteria, insects in walnuts likely to be mistaken for the codling moth, feeding habits in walnuts, varieties of walnuts attacked, amount of infestation, dropping of nuts, distribution in California, parasites and predators, and control.

The highest infestation noted in any particular orchard in California during the years 1919 to 1925 was 37 per cent. Spraying with basic arsenate of lead is said to be the most satisfactory method of control. Dusts containing 15 per cent of basic arsenate of lead may also be employed, but the data obtained in the author's investigation show that the poison applied as a dust is not so effective as when applied as a spray.

Airplane dusting in the control of malaria mosquitoes, W. V. King and G. H. Bradley (*U. S. Dept. Agr., Dept. Circ. 367 (1926), pp. 16, figs. 8*).—This is a report of experiments conducted during 1923 and 1924 in the vicinity of Mound, La., in which Army DeHaviland 4-B planes, operated by U. S. Army Air Service pilots, were used. These planes had been adapted for cotton dusting by installing metal dust hoppers in the rear cockpits, with an arrangement provided for releasing the dust through the bottom of the fuselage. The insecticide was Paris green mixed with an inert dust, in most cases a finely ground silica earth, as a diluent and carrier. Road dust and a mixture of lime and flour were tried in a few cases with fairly good results, but it seemed desirable to obtain a substance more uniform in quality and more certain as a source of supply than the former, and there was a tendency for the flour and lime to become packed in the hopper. The authors' experience indicates that approximately 0.5 lb. of Paris green per acre will give a safe margin for the treatment of such places as rice fields and the more open parts of the lakes, the quantity being increased as necessary where the breeding area is protected by a growth of trees and brush.

It was found that a given area could be covered rather thoroughly with the dust, and that by taking advantage of a light breeze a wide strip could be treated with each trip of the plane. A wind velocity as high as from 10 to 15 miles per hour was, however, a disadvantage in making the dust applications, and the operations were usually discontinued when the stronger winds were blowing. The results of the entire series of tests in the reduction of larvae were variable, owing in part to the failure of the dust to reach all of the area under observation and in part to an unsatisfactory lot of Paris green which was used in a number of the experiments and which proved to have a very low toxicity for the larvae. With an experienced pilot, and when careful attention was given to the spread of the dust, no special difficulty was encountered in distributing the dust over the treeless parts of the lakes. Furthermore, from a single experience in treating rice fields, this type of breeding place appears to be particularly well adapted to control by air-plane dusting because of the absence of trees and other obstructions which interfere with close flying. Even in heavily-wooded areas, when enough dust was used to

offset the considerable wastage due to adherence to the leaves and to wind drift, it was found to have penetrated the thick growth and to have reached the water in sufficient quantities to destroy the larvae.

"The two final tests of 1924 gave particularly clear-cut results, and for this reason were of special interest in showing the possibilities of this method of control in breeding areas of the type represented, the lakes being overgrown with aquatic vegetation and having an abundance of Anopheles larvæ well distributed throughout. In the first of these a larval reduction of 88 per cent occurred as a result of the treatment, and in the second over 99 per cent were killed, as estimated by the writers' method of examination. The only larvae remaining in the second instance were a few of the smallest size, which were found in one small spot. In each test a series of pans containing a counter number of larvae were distributed over the lake as a further check on the effectiveness of the poisoning. In the first test 92 per cent of these larvae were killed, and in the second all were destroyed."

Life history of the variegated cutworm Tachina fly, Archytas analis, H. W. Allen (*Jour. Agr. Research [U. S.], 32 (1926), No. 5, pp. 417–435, pl. 1, figs. 6*).—This is a contribution from the Mississippi Experiment Station, containing the results of life history investigations, based upon studies conducted during 1924. The species was found to belong to the larvipositing group, the maggots being deposited on the foliage frequented by the host, where they may live on the substratum for many days. They attach themselves to passing caterpillars if such be acceptable hosts, and bore through the cuticula to a position between it and the hypodermal layer, later passing into the body cavity, where they persist in the host until its pupal stage.

"The puparium is formed in the pupa of the host, only one parasite completing its development in each pupa. The time durations of the different stages differ widely with the season, the instar of the host when infested, and the time spent as a free-living larva. There appear to be at least two complete and several partial broods each season. Adults are preeminently nectar suckers, and congregate in swarms at the flowers of sweet clover and a number of other common wild and cultivated plants. They are powerful flyers, and there is some reason to believe that they migrate rather freely. They are present from early spring to late fall and are adapted to activity in wide extremes of weather. The parasite is broadly distributed over North America and parts of South America. It is moderately polyphagous, attacking several species of Lepidoptera. It is undoubtedly a valuable natural control for the variegated cutworm, and is also of some value as a parasite of several other caterpillar pests. It offers more promise than some species as a possibility in the field of biological control."

The control of the striped cucumber beetle, S. Marcovitch (*Tennessee Sta. Circ. 1 (1926), pp. 2, fig. 1*).—The author reports having obtained practically 100 per cent control of the striped cucumber beetle through the use of commercial sodium fluosilicate. Foliage injury appeared within three days after the insecticide was applied, but the plants outgrew the injury after two weeks. An "extralight" sodium fluosilicate, used undiluted, gave satisfactory control and no burning. For use as a dust the commercial sodium fluosilicate should be mixed with two parts of lime. For very young, tender plants the dust may be directed to the ground so that as the beetles crawl around under the plants they get some of the powder on their feet. The extra-light sodium fluosilicate may be used pure, without diluting with lime. Calcium fluosilicate "compound" is very safe on foliage but is less toxic than the sodium fluosilicate, and heavy applications must be made for satisfactory control.

The Japanese beetle, L. B. Smith and C. H. Hadley (*U. S. Dept. Agr., Dept. Circ. 363 (1926), pp. 67, pls. 2, figs. 36*).—This is a summary of information based upon investigations by the authors and other investigators at the Japanese Beetle Laboratory, at Riverton, N. J., reports of which have been noted (E. S. R., 46, p. 252; 47, pp. 56, 854; 48, p. 57; 49, p. 454; 52, p. 158; 53, pp. 258, 455).

Boll weevil in Oklahoma, especially during the years 1921 to 1925, C. E. Sanborn (*Oklahoma Sta. Bul. 157 (1926), pp. 32, figs. 14*).—The author reports that a three-year test with calcium arsenate as a dust spray for controlling the boll weevil indicates that it is not a satisfactory control in Oklahoma. An average gain of 45 lbs. of seed cotton per acre was obtained, but at a loss of $2.70 per acre. Molasses arsenate gave a profit of $13.31 per acre, nicotine arsenate a loss of $10.51 per acre, Hill's Mixture a profit of $0.46 per acre, and the Florida plan a loss of $1.09 per acre. It is pointed out that, of all the experiments conducted, the molasses arsenate treatment might be considered the most advisable to apply under Oklahoma conditions.

Effects on honeybees of spraying fruit trees with arsenicals, N. E. McIndoo and G. S. Demuth (*U. S. Dept. Agr. Bul. 1364 (1926), pp. 32*).—Following an introduction, this account deals with the effect on honeybees of spraying fruit trees in full bloom, based on preliminary experiments at Winchester, Va., and more extended experiments at Winthrop, Me., both in 1914 (pp. 3–10): the effect on honeybees of spraying fruit trees at the customary time, based on experiments conducted at Roswell, N. Mex., and at Benton Harbor, Mich., in 1915, at Winchester, Va., in 1915 and 1916, at Fennville, Mich., in 1916, and at Drummond, Md., in 1917 (pp. 10–22); and the minimum amount of arsenic fatal to bees in confinement, including a tabulated summary of results obtained by feeding arsenicals to bees in observation cages in 1914 and 1920 (pp. 23–26). A discussion of the literature in connection with a list of 15 references follows.

In the experiments at Winchester it was found that (1) bees work equally as well on trees sprayed in full bloom as on unsprayed ones, (2) they do not fly away from the sprayed orchard very much if the orchard is well isolated, (3) they are slightly affected when a small orchard is sprayed in full bloom, a conclusion supported by observations and by the analyses of the samples of bees collected, and (4) of the three mixtures named, the arsenate-lime-sulfur mixture was found the most satisfactory for experimental purposes. The unusual mortality of the bees at Winthrop was first noticeable the second day after they had had access to the sprayed flowers, and on the third day after they had been poisoned the damage was unmistakable. This heavy mortality continued as long as the sprayed flowers lasted, and in some of the colonies until all the bees had died. The symptoms of arsenic poisoning were very pronounced. In the early stage the adult bees became sluggish and soon neglected their duties, so that the brood apparently died of starvation; later their abdomens became greatly swollen, being filled with a yellowish watery liquid; still later the legs and wings became paralyzed; and finally the bees died in a state of coma. Not one of the 10 colonies used was killed outright, but in a comparatively short time 5 of them were entirely depopulated, while the other 5 were rendered more or less weak. It was thus ascertained that spraying fruit trees in full bloom under certain conditions is very injurious to bees.

Both at Winchester and Winthrop arsenic was found on all parts of the sprayed flowers, particularly on the pollen, and in most of the samples of the adult bees analyzed, but none was found in the samples of dead pupae and larvae. Of 12 samples of partially ripened honey analyzed only 1 contained arsenic, and that merely a trace.

"In regard to the spraying of fruit trees at the customary time, when 90 per cent or more of the petals had fallen at Winchester, Va., and Fennville, Mich., in 1916, under the most certain conditions, which are usually rare, it appears for the following reasons that the bees tested were not injured: (1) The old adult bees died more rapidly before than after spraying was begun, as was shown both by the daily weight records and by the number of dead bees counted in the bee traps; (2) the gain in weight after the spraying was begun, of all the old and young adult bees in two colonies tested was equal to the gain before the spraying was begun; (3) the results obtained from the chemical analyses of the samples of dead bees collected after the spraying was begun did not indicate that the bees had died of arsenic poisoning; and (4) no symptoms of arsenic poisoning were noticed among the bees under observation.

Biennial report of apiary inspection work, 1923–1925, C. S. Rude (*Texas Sta. Circ. 38 (1925), pp. 11, figs. 2*).—During 1923–24 inspections were made in more than 38,000 colonies in 63 counties. American foulbrood was found in 25 counties, of which 5 had over 25 cases each, while 12 had less than 10 cases each, and 3 only 1 case per county. During 1924–25 inspections were made in nearly 42,000 colonies in 67 counties. American foulbrood was found in 24 counties, of which 6 had over 25 cases per county, 12 had less than 10 cases, and 3 had only 1 case each. Approximately 1 per cent of the colonies examined during the bienium were infected with the disease. Every case found in 1924–25 was destroyed by burning. Inspections were made in 40 queen breeding apiaries in both years. In 1924–25 40 queen breeder's certificates were issued, and 11,500 copies of certificates were distributed.

The sterilization of American foulbrood combs, A. P. Sturtevant (*U. S. Dept. Agr., Dept. Circ. 284 (1926), pp. 29*).—The author concludes that, in view of the cultural results obtained in the investigations here reported, a 20 per cent solution of formalin in water is the most satisfactory disinfectant for use in sterilizing combs infected with American foulbrood, with regard to both germicidal action and low cost, provided the proper precautions were taken. All honey should be extracted, all brood cappings should be completely removed, and the combs should be treated at least 24 hours, or 48 hours if it is found desirable to wash them in water after treatment. Before such a procedure can be recommended unreservedly exhaustive tests must be carried out under apiary conditions.

ANIMAL PRODUCTION

Practical methods of estimating the proportions of fat and bone in cattle slaughtered in commercial packing plants, J. L. Lush (*Jour. Agr. Research [U. S.], 32 (1926), No. 8, pp. 727–755, figs. 10*).—This paper, from the Texas Experiment Station, gives the results of a study of the relation of the dressing percentages and percentages of fat and bone of different portions of the carcasses of cattle to the percentages of fat and bone in the entire carcass, for the purpose of more accurately estimating the percentage of fat in the bodies of cattle and the percentage of bone in the dressed sides. The basic data for the study consisted of the analyses of 30 steers and 3 cows made at the Missouri Experiment Station (E. S. R., 48, pp. 472, 474; 50, p. 868), the analyses of 4 steers made at the Maine Experiment Station (E. S. R., 8, p. 811), the analyses of 3 steers made at the Illinois Experiment Station (E. S. R., 28, p. 168), and the well-known analyses of 2 oxen and 1 calf made by Lawes and Gilbert.

The relations of the percentages of fat and bone in the entire animal to the dressing percentages and percentages of fat and bone in certain parts of

the carcass are shown graphically with fitted lines or curves and formulas to represent the relation, as well as correlation coefficients. The results show that the percentage of true fat in the lean and fat flesh is almost perfectly correlated with the percentage of true fat in the entire animal. The percentage of true fat in the offal fat and kidney fat was definitely related to the fatness of the animal, but this relation was curvilinear. The percentage of offal fat to live weight was the most reliable single indicator of fatness, with the percentage of caul fat to live weight ranking next in reliability, provided the animals compared were of the same sex and breed. Dressing percentage was reliable in wide ranges of fatness but not reliable within narrow limits of fatness. A combination of dressing percentage and percentage of caul and ruffle fat to live weight appeared to be the most reliable indicator of fatness in individual animals, but for groups of animals a combination of dressing percentage and percentage of offal fat to live weight was more desirable.

The percentage of bone in the dressed sides was indicated by the proportion of leg bones to live weight, but it was shown that such a relation was secondary, resulting from extreme differences in fatness and age. A negative correlation between the percentage of bone in dressed meat and the dressing percentage was found to be due to the high correlation between the degree of fatness and each of these percentages. There was little relation between dressing percentage and the percentage of bone in dressed meat with a constant degree of fatness. Prediction equations based on these indicators are presented, with examples for the use of such equations taken from data given in *Texas Station Bulletin 309* (E. S. R., 50, p. 775).

The percentage of fat in the flesh of the wholesale rib cut was found to be the most accurate indicator of the degree of fatness of the entire animal of any of the factors studied, but the difficulties of making this analysis are also pointed out.

[Feeding tests with coconut meal at the Guam Station], C. W. Edwards (*Guam Sta. Rpt. 1924, pp. 3, 4*).—In tests of the possibility of replacing a portion of the oats in the ration of horses, using 12 work horses, 3 stallions, 4 colts, 4 brood mares, and 5 native ponies, it was found that from one-third to one-half of the ordinary oat ration could be replaced by coconut meal, although some laxative effects from the coconut meal were apparent when the ration was first fed. In another experiment, substituting coconut meal for 50 per cent by weight of the corn in the usual corn and tankage ration was found satisfactory for feeding 5 dry sows on Para grass pasture.

The feeding of simple minerals to fattening steers, J. M. Evvard, C. C. Culbertson, Q. W. Wallace, and W. E. Hammond (*Iowa Sta. Leaflet 16 (1926), pp. 12, figs. 2*).—The results of two experiments dealing with the feeding of minerals to steers are reported, the first of which has been previously noted (E. S. R., 53, p. 770).

In the second experiment 5 lots of 7 2-year-old steers each, averaging approximately 980 lbs. in weight, were fed for 135 days on the standard Corn Belt silage and hay ration, with supplements of a simple mineral mixture, creek sand, simple minerals plus creek sand, or flake salt. The results indicated, as in the first experiment, that the feeding of 1 oz. of simple minerals per day increased the average daily gain approximately 0.2 lb., as compared with the check lot and decreased the feed required per unit of gain. The feeding of creek sand was not beneficial, as the cattle made smaller gains than the check lot which received no mineral supplements. The gains of the lot receiving salt were nearly as large as those receiving the simple minerals.

[Ground soy beans v. whole soy beans v. linseed oil meal for sheep] (*Ohio Sta. Bul. 392 (1926), pp. 82, 83*).—In an experiment at the Southeastern

Test Farm ground soy beans, whole soy beans, and linseed oil meal were compared as supplements to a liberal ration of shelled corn, alfalfa hay, and corn silage for fattening native light B- and C-type ewe and wether lambs. The supplements were each fed in the proportion of 1 part to 7 parts of corn. All lots made practically equal gains in a feeding period of 126 days. The calculated costs of gain were slightly higher in the linseed oil meal lot.

Swine investigations [at the Georgia Station] (*Georgia Sta. Rpt. 1925, pp. 107, 108*).—The soft pork investigations during 1925 have indicated that pigs fed from approximately 100 lbs. to 140 lbs. in weight on peanuts can not be hardened by corn feeding within the limits of a weight economical to produce. In further experiments it has been found that pigs weighing 125 lbs. can consume 300 gm. of peanut oil daily with no apparent physical disturbances, and from preliminary results it appears that other nutrients in the peanut have as much influence on the production of soft pork as the oil itself.

Experiments in pasturing dry-land crops with hogs [at the Huntley, Mont., Field Station], A. E. SEAMANS (*U. S. Dept. Agr., Dept. Circ. 369 (1926), pp. 27–29*).—In studies of the comparative values of dry-land pastures for swine (E. S. R., 54, p. 162), 2 sows and 17 pigs were pastured on 1 acre of winter rye with supplemental feeding of corn for 56 days, beginning May 16, during which time the pigs made an average daily gain of 0.38 lb. per head. Following the pasturing on winter rye the pigs were placed on 1 acre of field peas for 38 days, during which time they made an average daily gain of 0.63 lb. per head. After the close of the pasturing period on peas the pigs were pastured for 26 days on Sudan grass and soy beans, with corn self-fed. An average daily gain of 1.04 lbs. per head was made during this period, notwithstanding the fact that part of the pigs died of cholera and the rest were sick during the period. The remaining pigs were finally pastured for 41 days on 1 acre of corn, and during this period they made average daily gains of 1.10 lbs.

In another experiment fall pigs were used for pasturing 0.5-acre plats of alfalfa and brome grass. Each crop was grown in rows and broadcast in different plats. A 3 per cent ration of corn was also fed as a supplement. Results showed that the 3 pigs on the alfalfa grown in rows made an average daily gain of 1.31 lbs., as compared with 1.41 lbs. on the alfalfa sown broadcast. The 2 pigs on brome grass sown in rows made an average daily gain of 1.02 lbs., while those on brome grass sown broadcast made an average daily gain of 1.04 lbs. The feeding period lasted 56 days. On the basis of the results from the check lot fed on skim milk and corn, it was calculated that the following amounts of grain were replaced per acre of pasture: By alfalfa sown in rows, 466 lbs.; alfalfa sown broadcast, 616 lbs.; brome grass sown in rows, 253 lbs.; and brome grass broadcast, 281 lbs.

Crop-utilization experiments [at the Huntley, Mont., Field Station], R. E. HUTTON (*U. S. Dept. Agr., Dept. Circ. 369 (1926), pp. 32–38*).—The results of continued swine-feeding experiments (E. S. R., 54, p. 161) are given.

Pasturing alfalfa with hogs.—The results of pasturing 0.25-acre plats of third-year alfalfa in a 6-year rotation with spring and fall pigs are summarized for the entire period over which this experiment has been running. Five fall pigs, averaging 90 to 125 lbs., were used in the pasturing trials from May until the middle of July, and 8 spring pigs from July until October, but cholera prevented the feeding of the spring pigs during 1924. Combined results of all the years showed that the fall pigs receiving a 2 per cent ration of corn, plus the alfalfa pasture, made an average daily gain of 0.93 lb. per head and required 315 lbs. of corn per 100 lbs. of gain. Spring pigs made an average daily gain of 0.47 lb. per head and required 258 lbs. of corn per 100 lbs. of gain. The results of the 1922–1924 trials are tabulated separately.

Hogging off corn.—The combined results of the 13 trials for the period 1912–1924 in hogging off 0.25-acre plats of corn by fall pigs as soon as they completed the summer pasturing on the alfalfa in the above experiment showed that average gains of 727 lbs. were made per acre. It was estimated that these pigs consumed 461 lbs. of corn per 100 lbs. of gain.

Hogging off corn and rape.—Nine years' results in hogging off corn and rape are reported. During these years the pigs made average gains of 772 lbs. per acre and consumed 412 lbs. of corn per 100 lbs. of gain, 45 lbs. more pork per acre being obtained than on corn alone, as noted above.

Native-grown Northwestern Dent corn compared with No. 2 Yellow Dent corn grown in the Corn Belt.—The results of two years' trials in comparing native-grown Northwestern Dent corn with No. 2 Yellow Dent corn from the Corn Belt, both supplemented with tankage self-fed in 1922 and with skim milk in 1923, are given. During the tests, averaging 73 days in length, the pigs receiving the native Northwestern Dent corn made an average daily gain of 1.34 lbs. per head and consumed 387.60 lbs. of corn plus 21.63 lbs. of tankage in 1922 and 332.37 lbs. of skim milk in 1923. The pigs receiving the Yellow Dent corn made an average daily gain of 1.44 lbs. and consumed 363.30 lbs. of corn and 17.96 lbs. of tankage in 1922 and 318.34 lbs. of skim milk in 1923.

Feeder-pig production.—In a comparison of self-feeding and limiting the amount of corn to 1.5 lbs. daily per head for feeder pig production, 80 animals, averaging approximately 50 lbs. in live weight, were placed on alfalfa pasture. The 60 pigs receiving the limited ration were pastured at the rate of 27 pigs per acre, and the 20 self-fed at the rate of 40 per acre. At the close of the 81-day pasture period 19 pigs from each lot were finished in dry lot and the balance sold as feeders, at which time the pigs which had been receiving the limited corn ration averaged 94.1 lbs. in weight as compared with 141.4 lbs. for those self-fed. The self-fed animals required 51 lbs. more grain to produce 100 lbs. of gain during the pasturing period than those on the limited ration.

In the finishing period the pigs which had previously been fed the limited ration required 59 days to reach an approximate weight of 200 lbs. as compared with 37 days for those that were self-fed on pasture. The rate of gain was, however, approximately equal in both lots, 1.87 and 1.82 lbs., respectively, per head daily. A financial comparison of the returns from the feeder pigs and from those finished is also given.

[Swine-feeding experiments at the Ohio Station] (*Ohio Sta. Bul. 392 (1926), pp. 56, 57, 58*).—The results of the following experiments are briefly reported:

Yeast fermented feed.—Feed fermented with yeast produced more rapid but more expensive gains.

Soy bean oil meals for pigs.—In two trials four different types of soy bean oil meal were fed with corn to determine the effect of the manufacturing processes on the feeding value. The results indicated that the meals made by the expeller and hydraulic processes were superior to solvent meal and to an expeller meal having a raw, beanlike color, taste, and odor. The more desirable expeller process meal had a nutlike taste and odor.

Cooked and heated v. raw soy beans.—The digestibility of raw and cooked soy beans was found to be approximately the same, 82 per cent. The digestibility was decreased from 5 to 10 per cent by roasting the beans, although this treatment increased the palatability and efficiency for the production of growth in several feeding experiments with pigs as well as with albino rats.

Pastures for pigs.—In comparing sweet clover, soy beans, rape, and second-growth red clover as pastures for swine, the combined results indicated that they ranked in the order named, beginning with the poorest, with reference to the rate of gain produced and the concentrates required per unit of gain. The soy-bean pasture was very palatable and doubtless would have proved as satisfactory as rape or red clover if it had produced new growth after grazing.

Rickets and mineral requirements.—In dry lot feeding experiments on a ration of white corn, wheat middlings, linseed meal, and salt, ground limestone proved much superior to purified lime products, such as calcium carbonate, as sources of minerals. The same grain ration supplemented with pure calcium carbonate was much improved by the addition of iron, potassium iodide, and sulfur, indicating that the superiority of ground limestone over calcium carbonate was due to its content of these impurities, and also indicating the need of the animals for such substances.

Stiffness was apparent in certain of the pigs toward the end of the 158-day trials, due to the lack of vitamins in the rations, even though they were receiving ample minerals and were exposed to sunlight. Pigs on similar rations on pasture did not show any evidence of stiffness or rickets.

Supplements of either fish meal or tankage to the deficient grain mixture supplied efficient minerals as well as proteins. The bones of pigs fed fish meal or tankage were in every case well calcified and strong, but certain of the animals occasionally became stiff. Leafy pea-green alfalfa meal prevented stiffness in a very satisfactory manner.

The digestibility and energy values of feeds for horses, J. B. Lindsey, C. L. Beals, and J. G. Archibald (*Jour. Agr. Research* [*U. S.*], *32* (*1926*), *No. 6, pp. 569–604, fig. 1*).—The digestibility and metabolizable energy of 16 horse feeds, corn meal, shelled corn, ground barley, gluten feed, linseed meal, oats, wheat bran, corn bran, brewers' grains, cottonseed meal, oat feed, corncobs, hay (fine), oat hulls, hay (coarse), and alfalfa, have been determined in a series of 31 metabolism experiments extending over a period of five seasons, beginning each year in November and ending in April. Two horses were used in each experiment. The feeding periods were from 15 to 21 days in length, with collection periods in the last 8 days of each. The digestibility and the metabolizable energy of the feeds were determined by the usual method. The energy value of the methane was calculated by the method of Lehmann et al. (E. S. R., 5, p. 822), which allowed 0.7 calorie for each gram of digested fiber. The net energy values of the feeds were calculated directly from the metabolizable energy by the method of Zuntz et al. (E. S. R., 11, p. 72), in which the loss of heat due to increased metabolism was estimated at 9 per cent, and the energy expended for digestion was estimated at 2.65 calories per gram of crude fiber present.

The data for each experiment are presented in tables showing the composition, digestibility, and energy values of the rations as fed. The relations between the percentage composition of the different feeds in fiber content, digestible dry matter, and net energy values are given, as well as the percentage efficiency of the energy and the calculation for comparing the metabolizable and net energies by the indirect method of Zuntz, in which the pounds of digestible organic matter are multiplied by 1.796 to give the metabolizable energy in therms per 100 lbs. The animals were in positive nitrogen balance in most of the experiments.

The general results showed that the percentage net energy values varied from 0 for such substances as corncobs and oat hulls to 60 per cent or more

for certain of the grains. Net energy values increased as the content of crude fiber decreased, which accounted for some variability in different samples of hay, but differences in digestibility of the fiber were also apparent. The fiber of corn bran had a higher energy value than that of oats, corncobs, or wheat bran. There were considerable differences in the metabolizable and net energy values of feeds as calculated by the direct and indirect methods described. Higher values were obtained by the indirect methods for the coarse feeds, such as alfalfa and timothy hay, but similar values were calculated for the feeds with little fiber by both methods with the exception of barley. The direct method is given the preference where they differed.

[Feeding experiments with poultry at the Ohio Station] (*Ohio Sta. Bul. 392 (1926), pp. 62–70, figs. 3*).—The results of three feeding experiments are given in addition to those noted from another source (*E. S. R., 53, p. 873*).

Meat meal v. meat scraps for egg production (pp. 62, 63).—In a single test, three lots of 30 Barred Rock pullets each were fed for 12 months on a scratch feed consisting of yellow corn, wheat, and oats (2:2:1), and a mash consisting of equal parts of ground yellow corn, ground oats, wheat bran, and winter wheat middlings. This basal ration was supplemented in one lot with 20 per cent of meat scraps containing 50 per cent of protein, in another lot with 13.3 per cent of meat meal containing 75 per cent of protein, and in a third lot with 13.3 per cent of meat meal containing 75 per cent of protein, plus 2 per cent of mineral mixture containing raw bone meal, ground limestone, and salt. During the year of the test the lot receiving the meat scraps laid an average of 150 eggs per bird and the mortality was 10 per cent. The average egg production in the lots receiving the meat meal with and without the minerals was, respectively, 132 and 144 eggs per pullet. The mortality in these lots was 10 and 13.2 per cent, respectively. These results do not show any particular advantage for the meat meal containing the high percentage of protein.

Stability of cod-liver oil in feed mixtures (pp. 68, 69).—Four lots of 20 White Leghorn day-old chicks each were fed on a basal ration consisting of ground white corn, wheat middlings, casein, and minerals, with the addition of 2 per cent of cod-liver oil. For lot 1 fresh cod-liver oil was added every 2 weeks to the basal ration after the ration had been stored at 70° F. for 4 months. For the other lots the cod-liver oil was mixed with the basal ration at the beginning of the 4 months' storage period, and the feed mixture for lot 2 was stored in gunny sacks at 32°, for lot 3 in gunny sacks at 70°, and for lot 4 spread out in 2-in. layers at 70°. No signs of leg weakness were evident in any of the lots, but a ruffled condition of the feathers indicated a nutritional deficiency from both rations stored at 70°. Analysis of the tibias at 12 weeks showed no difference in the ash content, indicating that the antirachitic vitamin was not injured by the 4 months' storage, but that vitamin A was wholly or partly destroyed.

Calcium requirement of the growing chick (pp. 69, 70).—Eight lots of 15 White Leghorn day-old chicks each were given a basal ration of white corn, wheat middlings, casein, salt, and cod-liver oil, supplemented with 0, 0.125, 0.25, 0.5, 1, 1.5, 2, and 4 parts of pure calcium carbonate per 100 parts of the ration for the respective lots to determine the amount of calcium which it was necessary to add to the ration for normal growth. The results indicated that approximately 1.5 lbs. of calcium carbonate incorporated in 100 lbs. of the basal ration insured against leg weakness and produced bone having the maximum ash content.

In another study of the efficiency of various calcium salts and supplements for the prevention of leg weakness, 11 lots of 15 White Leghorn day-old chicks

each were given a similar basal ration to which supplements were added in sufficient amounts to supply an equivalent of 1.5 per cent of calcium carbonate. These materials consisted of calcium carbonate, calcium sulfate, calcium lactate, tricalcium phosphate, dicalcium phosphate, raw rock phosphate, raw bone meal, spent boneblack, ground limestone, bone ash, and precipitated bone flour. After 12 weeks' feeding representative birds were killed for bone analysis. The results indicated that all the supplements except raw rock phosphate prevented leg weakness and produced a bone with a normal ash content. The best growth was obtained when the ration was supplemented with tri- or dicalcium phosphate, raw bone meal, spent boneblack, or bone ash.

Broodiness in relation to fecundity in the domestic fowl, F. A. Hays and R. Sanborn (*Massachusetts Sta. Tech. Bul. 7 (1926), pp. 53–83, figs. 2*).—This is a report of the progress made in the improvement of the egg-laying qualities of the Rhode Island Red flock at the station (E. S. R., 48, p. 574), which has been brought about largely by selection. During the progress of the work the importance of broodiness has been evident, and broody and nonbroody strains have been developed. It is shown that in the nonbroody strain the percentage of broody birds and the average number of broody periods have both decreased as the experiment has progressed from 1912 to 1923.

The bulletin deals particularly with the relation between the various aspects of broodiness to seasonal and annual egg production during the first laying year. The relations are mainly expressed by means of correlation coefficients and regression coefficients determined from the three groups as follows: Total combined population of broody and nonbroody birds, only birds which were broody in their pullet year, and all birds which were broody without regard to the degree. The calculated correlations tend to show that broodiness is negatively and significantly correlated with annual egg production, but that broodiness is not closely correlated with the December or winter rate of egg production. Broody birds lay at a higher rate when laying than nonbroody birds not only in the broody season but also in the winter. Other relations between broodiness and seasonal production are also pointed out.

Artificial incubation, E. W. Henderson (*Missouri Sta. Circ. 142 (1926), pp. 8, figs. 3*).—This gives directions for the management of breeders, the selection and care of hatching eggs, and the operation of an artificial incubator.

Second World's Poultry Congress and Exhibition, held at Barcelona, Spain, May 10–18, 1924 (*Barcelona: Graphic Art Co., Ltd., 1924, pp. 93+416, pls. 56, figs. 4*).—In addition to the miscellaneous information included in part 1 of these proceedings, the papers which were presented at the congress are given in part 2 as follows:

Section 1. *Mundial experiences and researches.*—In this section the papers are included under the following headings.

I. *Biology, genetics, anatomy, physiology, and animal experiments.*—Contribution to Embryological Technique, by J. Pujiula (pp. 7–9); The Development of the Nervous System in the Embryo of the Fowl during the First Days of Incubation, by J. F. Tello (pp. 10–12); Biological Studies on Secondary Sexual Characteristics and Heredity among Gallinaceae (pp. 13, 14); On some Investigations into the Physiological Action of Glycero-Phosphoric Acid Administered to Fowls, by N. Stigliano (pp. 15–17); On the Inheritance of Colour in the Guinea Fowl (pp. 18, 19) and The Copulative Organ of Domestic Palmipeds (pp. 20, 21), both by A. Ghigi; Sex-Reversal in the Domestic Fowl, by F. A. E. Crew (pp. 22–24); Gynandromorphism, by Pezard, Sand, and Caridroit (pp. 25–29); Future Mendelian Research in Poultry, by R. C. Punnett (pp. 30–35); Temperature and Animal Heat, by F. Farjon (pp. 36–44); Colour

Changes in Plumage of Poultry After Thyroid Administration, by E. Giacomini (pp. 45–47); The Ileocolic Valve and the Caecal Diverticula in the Posterior Intestine of the Fowl, by A. Corti (pp. 48–50); Popularising of Genetics and How to Make this Science as Comprehensible as Possible, by K. Kuiper (pp. 51–56); Modification of the Character and the Qualities of Different Races of Poultry Owing to Changed Conditions of Living, by R. Houwink Hzn (pp. 57, 58); Results of the Cross, Coucou de Malines, Mated with Neapolitan for the Production of Cross-bred Table Poultry, by R. Giuliani (pp. 59, 60); Genetic Factors Involved in the Mortality of Chick Embryos, by L. C. Dunn (pp. 61–67); The Hereditary Resistance of the Fowl to the Bacillus of Diphtheria, by J. L. Frateur (pp. 68–71); and The Laying Life of a Hen as Indicated by Her Structure, by W. Powell-Owen (pp. 72–77).

II. *Exhibitions and selection of good layers.*—Poultry Standards, by A. Heyndrickx (p. 78); Something Concerning Scales of Points, by P. Castro Biedma (pp. 79–82); The Desirableness and Possibility of International Standards of Perfection, by C. S. van Gink (pp. 83–86); Shows, by A. Heyndrickx (p. 87); The Individual Egg Production Performance Record as a Basic Factor in Establishing Permanence in the Poultry Industry, by W. C. Thompson (pp. 88–92); The Percentage of Good Layers and the Average of Their Egg Production, by S. Castelló (pp. 93–98); Variations in the Weight of Eggs: Importance of the Least Variation of Weight for Purposes of Selection, by C. Voitellier (pp. 99–102); Principles of Regular Selection and Systematic Improvement in Backyards, by M. G. Legendre (pp. 103–112); and The Influence of Meteorological Conditions on Laying, by Lapland and Garnier (pp. 391–395).

III. *Ethnology and information on new and old races.*—The *Gallus inauris* and the Hen Which Lays Blue Eggs, by S. Castelló (pp. 113–118); The Russian Fowls, by Fried (pp. 119–121); The Orloff Breed, by A. Ossipoff (pp. 122, 123); Sicilian Poultry, by F. Tucci (pp. 124–126); The New Spanish Poultry, the so-called "Paraisos," by H. Castelló de Plandolit (pp. 127, 128); The Poultry Breeds of Cataluña, by M. Rossell y Vila (pp. 129, 130); and Expansion of Indigenous Breeds in Poland and Its Causes, by M. Trybulski (pp. 131–134).

IV. *Feeding.*—Modern Ideas on Nutrition Based on the Study of the Vitamines Present in Poultry Foods, by R. Solá Esprin (pp. 135–137); Feeding of Poultry, by P. Laborde-Bois (pp. 138–141); Digestible Nutrients of Poultry Foods as Determined by Laboratory Feeding Tests, by B. F. Kaupp (pp. 142–147); The Influence of Cod Liver Oil on Growth and Egg Production in Poultry, by J. B. Orr (pp. 148–151); Modern Poultry Feeding, by T. Newman (pp. 152–156); and Observations on the Employment of Nettles in Chick Feeding, by A. Mollo (pp. 157, 158).

Section 2. *Concerning the action of the governments, the societies, and other official institutions in favor of aviculture.*—Avicultural Instruction in Spain, by J. Nonell (pp. 161, 162); Stamping Eggs, by G. Rodenhuis (pp. 163–165); The Marking of Eggs, by V. Pulinckx-Eeman (pp. 166, 167); Organisation of the National Poultry Institute in England, by H. E. Dale (pp. 168–172); The Cooperative Poultry Association of the Polish Republic, by A. Zacharski (pp. 173, 174); Report of the Poultry Societies of France, Their Progress, and Their Influence on Poultry Production, by R. Caucurte and H. Fouquet (pp. 175–178); Legislation and Its Relation to Egg Trade Improvement in Canada, by W. A. Brown (pp. 179, 180); The Action of the Italian Government in Favour of Poultry-Keeping (pp. 181, 182); The Sanitary Control of Eggs and Poultry in Paris and the Seine Department, by H. Martel (pp. 183–201); and The Training of a Poultry Instructor, by P. H. Foulkes (pp. 396–401).

Section 3. *Hygiene and diseases of poultry.*—The papers appearing in this section (pp. 205–250) are noted on page 177.

Section 4. ***Production of poultry products and commerce in same and the state of aviculture in various countries.***—The Economic Value of Poultry on the Farm, by A. G. Ruston (pp. 253–260); The Rearing of Chickens on the Intensive System, by R. H. A. Plimmer and J. L. Rosedale (pp. 261–277) (E. S. R., 51, p. 376); Nihil novum sub sole Regarding the Rules of Lighting of Poultry Houses and the Distribution of Food to the Fowls during the Long Winter Nights, by S. Castelló (pp. 278–280); Preparation of Poultry and Small Farm Animals for Despatch and Sale, by Herbinet (pp. 281–294); The Production of Poultry in Bresse, by L. Duc (pp. 295–299); The Poultry and Egg Industry in Denmark, by W. A. Kock (pp. 300–302); Avicultural Industry in Czechoslovakia, by M. Kuklova (pp. 303–314); The Commercial Chicken Fattening Establishment at Codogno, Italy, by A. Pirocchi (pp. 315–317); On the Trade in Eggs and Poultry Both for Home Consumption and for Export, by L. Gandolfi (pp. 318–320); Egg Production in the Various Districts of Italy Studied by Means of Railway Transport Statistics, by A. Vecci (pp. 321–323); Poultry Keeping on Metayeges of Romagne, by M. Marani (pp. 324–326); Commercial Egg Farming, by H. M. Morrison (pp. 327–331); The Organization of Poultry Work in the United States, by M. A. Jull (pp. 332–340); The Poultry Industry in British India, by Mrs. A. K. Fawkes (pp. 341, 342); Indian Runner Ducks in New Zealand, by S. H. Scott (pp. 343–345); Egg Production in New Zealand and How We Get It, by J. N. McLean (pp. 346–350); The Poultry Industry in Burma, by G. L. Johnson (pp. 351–354); The Organization of the Utility-Poultry-Industry in the Netherlands, by P. H. Burgers (pp. 355–363); The Development of the Egg Trade in the Netherlands, by J. Breukers (pp. 364–368); Transportation of Poultry, by B. van Asperen Vervenne (pp. 369–372); The Discovery by Charles Tellier, "The Father of Refrigeration"; Preservation of Poultry and Eggs by Cold Storage, by de Mauny (pp. 373–375); Avian Production, the Trade in and Consumption of Eggs and Poultry in Spain, by J. M. Guillén García (pp. 376–378); The Organisation of Cold Storage Transport in France: Its Application to Aviculture, by Malatier (pp. 379–383); and Summary of the Avicultural History of Spain and the Influence which Instruction and Especially the Teachings of the Traveling Instructor Has Had in the Development of Poultry Breeding in this Country, by J. Ferrer Calbetó (pp. 384–387).

Rules and regulations for the third Utah intermountain egg-laying contest, B. ALDER (*Utah Sta. Circ. 61 (1926), pp. 4, fig. 1*).—General information and rules for the third contest (E. S. R., 53, p. 877) are given.

DAIRY FARMING—DAIRYING

Calcium and phosphorus metabolism in dairy cows, E. B. MEIGS, W. A. TURNER, T. S. HARDING, A. M. HARTMAN, and F. M. GRANT (*Jour. Agr. Research [U. S.], 32 (1926), No. 9, pp. 833–860, figs. 3*).—The results of two experiments conducted by the Bureau of Dairying, U. S. D. A., and dealing with the calcium, phosphorus, and nitrogen assimilation by 2 dairy cows in each experiment are reported.

As a general procedure the urine and feces were collected together, except in two periods during the first experiment when separate collections were made by attendants to study the effect of composite sampling on the analyses. In general, composite samples of the daily collections were analyzed for each of the three elements, with a few daily analyses for comparison. Because of the lag in the digestive tract of cattle the intake of the elements during a period was compared with the outgo of the elements during the same period after omitting data for the first two days of that period and including data for the first two days of the following period.

The first experiment was carried out in March and April, 1923. The main objects were to determine the possibility of maintaining calcium and phosphorus equilibrium in cows milking at different levels of milk production when alfalfa hay of known origin was fed, and also to study the effects of various experimental procedures on calcium and phosphorus metabolism. The experiment was divided into nine 4-day periods, and two grade Guernsey cows were used as the experimental animals. The feed consisted of a grain mixture and second or third cutting alfalfa hay. The hay had heated somewhat after being put in the barn, and many musty portions were present. In periods 5 and 6 the urine and feces were collected separately by attendants. The average daily intake of calcium, phosphorus, and nitrogen in the feed and the outgo in the urine and feces and in the milk, together with the balances and calculated assimilation (difference between amounts of the elements in the feed and in the feces and urine), are tabulated separately for each cow in each of the periods.

A study of the results showed that the assimilation of the elements, especially calcium, was much more constant by the older and more phlegmatic cow than by the other cow, which was more nervous and showed greater effects from changes in the regular routine. Such changes as were necessary in the separate collection of the excreta caused the latter cow to frequently go off feed, reduced the milk yield, and were apparently generally unfavorable to calcium assimilation. When the cows were not disturbed they assimilated from 15 to 20 per cent of calcium in the ration.

The second experiment was carried on from October, 1923, to March, 1924, and was divided into 25 periods of 7 days each. The objects were to obtain further information on the assimilation of calcium, phosphorus, and nitrogen by cows when receiving alfalfa hay cured in different ways, and when fed over a long period on a diet deficient in calcium and phosphorus; to study the effect of the calcium and phosphorus stores or the administration of cod-liver oil on the rate of assimilation of the minerals; and to study the dependence of calcium and phosphorus assimilation on each other.

The older and quieter Guernsey from the preceding experiment and a grade Holstein were used as the experimental animals. The rations of both cows included a grain mixture, which was modified in its protein content when timothy hay was fed instead of alfalfa hay. During periods 1 to 4 the cows received good alfalfa hay, which had been cured under a shed with a minimum exposure to the sunlight. During periods 5 and 6 the good alfalfa hay was replaced by poor alfalfa hay, which had been allowed to lie in windrows for nine days and had been rained on considerably. During periods 7 to 17 timothy hay was fed. The cows again received the poor alfalfa hay in periods 18 to 23, but in periods 21 to 23 an additional supplement of cod-liver oil was furnished. Good alfalfa hay was fed during the two final periods.

The calcium and phosphorus balances were negative during the periods of feeding timothy hay and poor alfalfa, and did not appear to be improved by the addition of cod-liver oil, but diagrams showed that the decrease in the two elements in the body had not been uniformly proportional to the relation between calcium and phosphorus in normal bone. When phosphorus was lost more rapidly proportionately than calcium it was assumed that this element was taken from the soft tissues of the body, but when calcium was lost proportionately more rapidly it was assumed that phosphorus was being stored in the soft tissues. The nitrogen assimilation was definitely reduced when the poor alfalfa hay was fed. Milk yields were somewhat irregular, but there was a general tendency to drop off more rapidly on timothy hay and poor alfalfa than when good alfalfa hay was supplied.

Analyses of the blood serum for calcium and phosphorus at the end of the last period on timothy hay showed that normal amounts of these minerals were present in the plasma of one animal, but the other cow showed only 8.3 mg. of calcium, 9.8 mg. of total phosphorus, and 3.5 mg. of inorganic phosphorus per 100 cc. After this cow had received cod-liver oil for three weeks the amounts of the corresponding materials were increased to 9.0, 11.5, and 5.3 mg., respectively, per 100 cc. This may or may not indicate better assimilation of calcium and phosphorus, as these materials may have been taken from the bone.

The authors conclude from the results of their experiments and those of other investigators that calcium is better assimilated from well-cured timothy or alfalfa hay than from bone meal, also that calcium is better assimilated from fresh green material than from hay. The proportion of calcium and phosphorus in the ration appears to be an important factor in calcium assimilation. Phosphorus assimilation is evidently interfered with if there is more than twice as much calcium as phosphorus in the feed. A considerable variation in the mineral content of the different samples of the same hay is noted.

[Experiments with dairy cattle at the Ohio Station] (*Ohio Sta. Bul. 392 (1926), pp. 52–54*).—In addition to several previously noted, the results of the following experiments are briefly reported:

Mineral balance as affected by previous feeding and by water.—Four Holstein cows, each giving approximately 32 lbs. of milk daily, were used for comparing the effects of well water and distilled water, including the previous feeding upon the mineral balance. Two of the cows had been pastured during the preceding summer, while two had been on dry feed for approximately one year. The rations consisted of timothy hay mixed with molasses, beet pulp, and a grain mixture of corn, oats, and bran. All the cows lost calcium, although approximately three times as much was supplied in the ration as was being secreted in the milk, but the losses of calcium were about double for the cows brought in from pasture as compared with the cows previously receiving dry feeds. It is suggested that those on the pasture had built up larger reserves of calcium. The effects of the water were practically negligible so far as calcium assimilation was concerned. The cows previously receiving dry feed retained approximately 4 grains of phosphorus daily, while those which had been on pasture retained only very small amounts. Magnesium metabolism was the same for both groups.

Soy bean oil meal v. linseed oil meal in dairy rations.—Two groups of four cows each were used to compare the value of soy bean meal and linseed oil meal for milk production when fed with corn silage, mixed hay, and a grain mixture consisting of corn and oats. The two rations proved practically equal, the slight difference being only 2 per cent in favor of the soy bean oil mixture.

Sweet clover analyses.—Analyses were made of sweet clover at various stages of growth to determine the ash, nitrogen, calcium, magnesium, and phosphorus content for comparison with alfalfa, red clover, and soy bean hay. These analyses indicate that sweet clover ranks high in comparison with the other legumes in its calcium and phosphorus content. The analyses of the cuttings at various stages of growth show that sweet clover furnishes an abundance of lime and phosphorus as a pasture plant.

[Irrigated pastures for dairy cattle at the Huntley, Mont., Field Station], T. W. Moseley (*U. S. Dept. Agr., Dept. Circ. 369 (1926), pp. 38–42, fig. 1*).—The results of two experiments are reported in continuation of previous trials (E. S. R., 54, p. 167).

Pasturing experiments.—The combined results are given of studies of the comparative carrying capacity of 3-acre pastures for 1921–1924, in which one pasture was top-dressed annually with barnyard manure at the rate of 12 loads per acre, while the other received no treatment. It was found that the top-dressed pasture carried an average of 1.62 cows per acre daily during an average pasturing period of 136.5 days per year, as compared with the pasture not receiving manure, which carried an average of 1.34 cows per day during the same period. The manured pasture produced an average of 161.8 lbs. of butterfat per acre as compared with 135.4 lbs. from the unmanured pasture. Slightly more alfalfa hay, 1,036 and 851 lbs. per acre, respectively, was fed to the cows on the manured than on the unmanured pasture. The body weight of the cows on the manured pasture was maintained, while those on the unmanured pasture lost an average of 80 lbs. during the experiment.

Maximum carrying capacity of an acre of irrigated pasture.—The results are given of 6 years' experiments, from 1919 to 1924, to determine the carrying capacity of 1 acre of irrigated pasture. In these experiments the average pasture season is 137 days, and an average of 2.13 cows per acre were carried during this period. An average of 291.8 lbs. of butterfat was produced, and 1,183 lbs. of hay was fed supplementing the pasture. An average gain in body weight of 103 lbs. per acre was produced while on the pasture.

Cattle feeding investigations, W. L. Blizzard (*Oklahoma Sta. Bul.* [*149* (*1923*)], *pp. 3–8*).—This includes more complete accounts of experiments previously noted (E. S. R., 51, p. 571; 53, p. 169).

Care and management of dairy cows, T. E. Woodward and J. R. Dawson (*U. S. Dept. Agr., Farmers' Bul. 1470* (*1926*), *pp. II+37, figs. 20*).—Practical directions for the care, management, and feeding of dairy cattle are given, including a discussion of barn arrangement and common diseases and ailments.

Use of the camera in studying the growth and development of dairy animals, M. H. Fohrman (*U. S. Dept. Agr., Dept. Circ. 371* (*1926*), *pp. 24, figs. 35*).—Suggestions are given for photographing cattle, including illustrations of good and poor photography, and examples of the way in which photographs have been used as records of development in breeding experiments.

Transmitting ability of twenty-three Holstein-Friesian sires, R. R. Graves (*U. S. Dept. Agr. Bul. 1372* (*1926*), *pp. 32*).—The results are given of a study dealing with the transmitting qualities for milk and fat production of the 23 Holstein-Friesian sires listed in the Advanced Register Yearbook up to volume 29 which have six or more daughters with yearly records whose dams also have yearly records. The milk and fat production was calculated to a mature equivalent in all cases where the records were made by cows under 5 years of age. The individual records of each daughter and dam show that there was considerable variation among the daughters of the same sire and with respect to the relation of the dams' and daughters' production. From these results and a further analysis it seems apparent that the daughters' production is not a simple blend between that of the sire and dam.

The sires were ranked in order according to the average milk yield, butterfat yield, increase of milk, increase of butterfat, and the percentage of daughters that were better than their dams in milk and butterfat yield. This tabulation showed that none of the sires ranked first in all groups, though some had the same relative ranking in several groups.

The standard deviation and coefficient of variation were generally quite high among both the daughters of the individual bulls and dams, and in many cases variation between the daughters of individual bulls was greater than

between the dams of the same daughters, indicating the inability of the bull to produce daughters making uniform records. Some sires were, however, able to increase or decrease the milk yield and percentage of butterfat in milk of most of their daughters as compared with their dams, but most of the sires raised one and lowered the other. The type of breeding by which a sire had been produced did not appear to particularly affect his breeding ability.

Correlation coefficients between dams' and daughters' butterfat production for the offspring of individual bulls showed wide variation from −0.39 to +0.90, but studies of the effect of the sires on production when grouped according to the amount of correlation between the dams and daughters showed that the sires were as important in producing changes in the daughters' production as compared with their dams in one group as in another. It appears that both parents contribute to the milk and butterfat-producing capacity of their daughters, but in certain cases one parent may appear to be more influential because it carries more dominant factors.

A study of the data indicates that the factors for milk yield and butterfat percentage are inherited independently and in the majority of cases were indefinitely correlated, but in some cases a positive correlation was apparent.

Studies in milk secretion.—XVI, Progeny performance of Guernsey sires' sons, J. W. GOWEN (*Maine Sta. Bul. 327 (1925), pp. 197–252, figs. 3*).—A study is presented of the milk and butterfat production of the daughters produced by sons of Guernsey sires whose daughters' production records were analyzed in the preceding paper of this series (E. S. R., 54, p. 673). The largest part of the bulletin consists of a table giving the average age corrected milk yield, butterfat percentage, and butterfat yield of the daughters of each son having two or more daughters, arranged according to the grandsire.

The relative production of the daughters and of the granddaughters sired by sons of the more outstanding sires is discussed and compared. The records are tabulated to show the frequency of the different rates of milk and fat production, and it was found in general that as the sires' daughters' milk production or butterfat percentage increases the sons' daughters' milk yield or butterfat percentage tends to increase, but the increase of the sons' daughters averaged only 29 per cent for the milk yield, 23 per cent for the butterfat percentage, and 30 per cent for the butterfat yield of that of the sires' daughters.

In the practice of selecting a herd bull the importance of considering the production of the sires' daughters is pointed out, but it is also mentioned that the relationship between the production of a bull's half sisters and his daughters is not particularly great, due to the tendency for all the individuals to revert strongly to the average of the breed.

Influence of temperature on lactation (*Georgia Sta. Rpt. 1925, pp. 108, 110*).—Observations during 1925 have indicated that long continued periods of hot weather have a depressing effect on milk production, accompanied by a slight increase in the butterfat percentage. In experiments cows were artificially cooled by covering them during the day with light muslin cloths kept moist to stimulate cooling by evaporation. The results indicated that the artificial cooling was decidedly effective in overcoming the depressing effects of the hot weather, and no bad effects, such as colds or other physiological disturbances, were observed. It is pointed out that some of the benefits may have resulted from lessening the annoyance from flies and other insects. The cows showed better appetites and better food assimilation when kept cool.

A simplified type of milking machine (*New York State Sta. Bul. 524 (1925), pop. ed., pp. 7, figs. 3*).—A popular edition of the bulletin previously noted (E. S. R., 52, p. 879).

Practical methods of sampling and testing milk, cream, and ice cream, H. C. Moore and G. I. Ball (*New Jersey Stas. Circ. 186 (1926), pp. 11, figs. 5*).—Directions are given for determining the content of butterfat by the Babcock tests, solids-not-fat by the lactometer, and acidity by titration in milk and dairy products.

Commercial buttermilk, A. D. Burke (*Oklahoma Sta. Bul. 156 (1926), pp. 50, figs. 4*).—The first portion of this bulletin gives general directions for the production of commercial buttermilk. The second portion consists of summaries of experiments dealing with the effect of various factors on the quality of the product, part of which have been previously noted (E. S. R., 53, p. 177).

One of the experiments was designed to study the effect of metals on the flavor of commercial buttermilk. Four lots of 1.5 gal. each of skim milk were heated in a heavily enameled culture can to 190° F. for 1 hour and cooled to from 86 to 90° during the curdling period, but when these cans were inoculated with 3.8 per cent mother starter a strip of tin, copper, aluminum, or zinc, respectively, was suspended in the cans to determine the effect of the metal on flavor. Results showed that the tin and aluminum had no noticeable effect, while distinct metallic flavors were apparent in the cans having the copper and zinc strips.

In another similar experiment the effect of copper and zinc on the tendency of buttermilk to whey off was tested by placing pint bottles of commercial buttermilk exposed to the action of each of the metals in an ice box at 50° and in another place at room temperature. In general all samples appeared the same as the control, but there was some indication that the curd was firmer in the control sample than in buttermilk in which the metals were suspended.

Seven series of experiments were carried on to determine the most desirable temperatures and time of holding of commercial buttermilk as determined by the occurrence of the curd, the acidity, flavor and odor, and other characteristics. The combined results of these experiments indicated that the best sterilization resulted when skim milk was heated from 180 to 190°, followed by immediate cooling. The best flavor occurred when the acidity was allowed to develop to from 0.8 to 0.85 per cent. The viscosity increased with increases in the temperature of heating but was found also to be dependent on the vigor of the culture used, the temperature of incubation, and the amount of acidity.

In another experiment the effect of temperature and methods of breaking the curd on the various qualities of this product was tested. The results showed that wheying off tended to occur if the curd was broken by such vigorous agitation that foaming resulted, but by cooling to from 60 to 68° and breaking the curd without undue agitation followed by rapid cooling to 45°, this undesirable condition was not likely to occur.

In studies of the effect of additions of salt on the quality, it was found that salt had little effect on the wheying off, and there was no effect on flavor when added in quantities not exceeding 0.05 per cent. These results did not show any particular advantage from the addition of salt. A distinct change in flavor which was considered undesirable followed the addition of 0.1 per cent of salt.

A study of some commercial ice cream improvers, G. H. Isenberg and A. C. Baer (*Oklahoma Sta. Bul. 158 (1926), pp. 15*).—The effect of improvers on the qualities of ice cream has been determined in several experiments. Two

series of mixes were prepared containing 32.5, 34, and 36 per cent solids. One series was viscolized, while the other was not. Each mix in both series was divided into 11 parts, to which different improvers were added except that one was kept as a control. After standing 12 hours the acidity and viscosity of the mix were determined. The percentage overrun, flavor, body, texture, melting resistance, and appearance of the remelted mix were also observed.

The results indicated that the improvers which contained coagulating enzymes or gums or both had no effect on the development of acid in the mix, but they did increase its viscosity. The improvers had no effect on the amount of overrun produced, but they improved the flavor of ice cream having a low percentage of solids by producing a smoother body and texture and imparting a rich creamy flavor. The melting resistance was also increased. Most of the improvers tended to detract from the appearance of the remelted ice cream. Ice cream containing improvers showed greater shrinkage in storage than control samples. The shrinkage was especially pronounced when such improvers contained coagulating enzymes.

VETERINARY MEDICINE

Annual report of the Department of Veterinary Science and Animal Husbandry [of Tanganyika Territory], 1924, F. J. McCall (*Tanganyika Ter. Dept. Vet. Sci. and Anim. Husb. Ann. Rpt. 1924, pp. 33*).—Details of work with infectious diseases, including rinderpest, tsetse fly and trypanosomiasis, contagious bovine pleuropneumonia, East Coast fever, anthrax, etc., are given. The Third Annual Report of the Veterinary Pathologist, Mpwapwa, for the Year Ending 31st December, 1924, by H. E. Hornby (pp. 21–33), is included.

Experiments on the influence of fatigue on infection, A. E. Boycott and C. Price-Jones (*Jour. Path. and Bact., 29 (1926), No. 1, pp. 87–95, figs. 3*).—The authors found that fatigue had no influence on the mortality of rats after inoculation with Gaertner's bacillus. After feeding, Gaertner's bacillus finds its way into the spleens of both fatigued and normal rats, but fatigue much increases the illness and mortality. Repeated fatigue did not break down the natural resistance of the rat to tuberculosis.

Alkali poisoning of livestock, M. R. Miller (*Vet. Med., 21 (1926), No. 6, pp. 268–273*).—In this contribution from the Nevada Experiment Station it is pointed out that horses and cattle of certain areas of southern Nevada are subject to a pathological condition known locally as alkali poisoning. This condition is locally attributed to the abundance of salts ingested with the feed and water. The author reports the results of analyses of alkalies and alkali waters of these areas in tabular form. He concludes that the presence of the large quantities of common salts in the waters and with the food of the affected animals may explain the condition on the basis of disturbed metabolism.

Miscellaneous tests of tetrachlorethylene, a new anthelmintic, A. S. Schlingman (*Jour. Amer. Vet. Med. Assoc., 68 (1926), No. 6, pp. 741–754*).—In experiments with this anthelmintic (E. S. R., 54, p. 675; 55, p. 70), the author found that when given to chickens, dogs, cats, foxes, sheep, cattle, and horses in varying doses it caused no toxic symptoms except in a few cases. Like carbon tetrachloride, it is very effective against bloodsucking worms, as shown by its action on hookworms of dogs, cats, and foxes and on stomach worms of sheep. It also possesses a high efficacy against roundworms in dogs, cats, chickens, and foxes.

Anthrax aggressin, C. E. Salsbery (*Jour. Amer. Vet. Med. Assoc., 68 (1926), No. 6, pp. 755–772*).—The author's investigations led to the conclusion that aggressin immunization against anthrax offers distinct advantages. He dem-

onstrated aggressive action, and showed that it produces active immunity. It was shown that antiaggressive serum may be produced by the gradual immunization with aggressins, and that this antiaggressive immunity may be passively transferred to other animals.

Latent infection in blackleg [trans. title], J. BASSET (*Compt. Rend. Soc. Biol. [Paris], 93 (1925), No. 22, pp. 170, 171; abs. in Trop. Vet. Bul., 13 (1925), No. 4, p. 130*).—The term latent infection covers different conditions, which must be carefully distinguished. A classification is presented.

Protective inoculation against blackleg by means of filtrates [trans. title], H. ZELLER (*Berlin. Tierärztl. Wchnschr., 41 (1925), No. 25, pp. 385–387; abs. in Trop. Vet. Bul., 13 (1925), No. 4, pp. 132, 133*).—The author here gives the details of protective inoculations carried out during 1924.

Studies on the etiology of heartwater, I, II, E. V. COWDRY (*Jour. Expt. Med., 42 (1925), No. 2, pp. 231–274, pls. 4; abs. in Trop. Vet. Bul., 14 (1926), No. 1, pp. 37–39*).—Two papers are presented on this disease of sheep, goats, and cattle in South Africa, transmitted by *Amblyomma hebraeum* (Koch), as follows:

I. *Observation of a Rickettsia, Rickettsia ruminantium n. sp., in the tissues of infected animals* (pp. 231–252).—"A Gram-negative, intracellular, coccus-like microorganism was found in cases of heartwater in the three species which are susceptible to the disease, namely, goats, sheep, and cattle. It was absent in the case of control animals, both normal ones and those dying of some other diseases. The presence of this microorganism was definitely related to the febrile reaction. It was most easily detected in the renal glumeruli and in the small capillaries of the cerebral cortex, but probaly occurred throughout the body. The microorganism was a typical endothelial parasite, being restricted in distribution to the endothelial cells of the smaller blood vessels and to portions of such elements which had broken off into the blood stream. It was never observed to cause injury to the cells other than those incident to mechanical distention through accumulation within them of many individuals in large densely packed masses which were characteristically spherical. A typical attribute was the presence of several of these masses within the cytoplasm of a single endothelial cell. In view of the association of this microorganism with heartwater, a disease of ruminants, and thus far the only one in which microorganisms resembling rickettsiae have been reported, the designation *R. ruminantium* is proposed."

II. *Rickettsia ruminantium n. sp. in the tissues of ticks transmitting the disease* (pp. 253–274).—The evidence offered above indicative of a causative relationship between *R. ruminantium* and heartwater is supplemented by the following observations concerning the ticks which carry the disease:

"When larvae which had taken no food since hatching were allowed to feed upon cases of heartwater they acquired rickettsiae which appeared to be identical with those in the tissues of animals suffering from heartwater, whereas control larvae hatched from eggs deposited by the same female and fed on normal animals remained free of rickettsiae. After larvae presumably infective had molted, the resultant nymphs, containing rickettsiae in their alimentary tracts, when fed upon susceptible animals produced in them typical attacks of heartwater, which the control nymphs, devoid of rickettsiae, failed to do. The tissues of animals thus infected were found upon histological examination to contain typical rickettsiae."

A comparative study of Pasteurella cultures from different animals, A. TANAKA (*Jour. Infect. Diseases, 38 (1926), No. 5, pp. 421–428*).—The author finds hemorrhagic septicemia bacteria isolated from various animals to show a marked similarity in their biochemic, cultural, and morphological char-

acteristics. No evidence was found by means of the agglutination and complement fixation reactions of indicated specific host differences among these organisms, although it is quite possible that group differences may occur. The invasive power of these organisms is usually high, particularly when freshly isolated and especially for certain animals, notably the rabbit. Their antigenic power is low as measured by the immunity stimulated in the animal and by immunological reactions in vitro.

Avian tuberculosis in mammals [trans. title], N. Plum (*K. Vet. og Landbohøjskole [Denmark], Aarsskr. 1925, pp. 63–185, fig. 1; abs. in Jour. Amer. Vet. Med. Assoc., 68 (1926), No. 5, pp. 667, 668*).—This is an extensive review of the occurrence of avian tuberculosis in man and in laboratory and dimesticated mammals, with 72 references to the literature. The abstract is by C. P. Fitch.

The occurrence of Brucella abortus and Mycobacterium tuberculosis in cows' milk, G. S. Wilson and M. M. Nutt (*Jour. Path. and Bact., 29 (1926), No. 2, pp. 141–148*).—The authors report upon 488 samples of cows' milk which they examined by guinea pig inoculation. From 68 of these in which acid-fast bacilli were found microscopically they failed to cultivate any saprophytic acid-fast bacillus, and they conclude, therefore, that, if in the lesions in a milk-injected guinea pig acid-fast bacilli are found, the milk contained tubercle bacilli. In milk-injected guinea pigs killed three weeks after inoculation, nontubercular lesions of the lymphatic glands, particularly of the sublumbar glands, are often present. From about one-third of these glands the authors cultivated *Br. abortus.*

"*Br. abortus* is not infrequently found in milk-injected guinea pigs, growing in association with the tubercle bacillus. There is no evidence that this results in an activation of the virulence of either organism. There is no evidence that the association existing between *Br. abortus* and *M. tuberculosis* in milk is other than a purely chance relationship. It is calculated that about 5.7 per cent of single milks and 8.8 per cent of mixed milks are infected with *Br. abortus.* Incidentally 13 per cent of mixed milks have been found to contain the tubercle bacillus."

Infectious abortion in cattle (ninth report), L. F. Rettger, J. G. McAlpine, G. C. White, and R. E. Johnson (*Connecticut Storrs Sta. Bul. 137 (1926), pp. 3–17, figs. 4*).—*Part 1 (pp. 3–13) of this ninth report (E. S. R., 54,* p. 774) deals with further observations on avenues of infection. The experiments tend to support the conclusions of other investigators that infection by *Bacterium abortus* may be brought about by the oral administration of artificial cultures of the organism or of secretions, etc., of *B. abortus*-discharging animals. It is pointed out that these observations are contrary to the earlier results obtained at the station, for which no explanation can be given at present. While it seems to be true that heifers and cows are most susceptible to infection after they have been successfully bred and during the period of pregnancy, there is abundant evidence that *B. abortus* infection occurs in animals that have never been mated.

In part 2 (pp. 13–17) the influence of early colostrum feeding on the blood reactions of the calf is dealt with, a résumé of which has been noted from another source (E. S. R., 54, p. 277).

The cattle grubs or ox warbles, their biologies and suggestions for control, F. C. Bishopp, E. W. Laake, H. M. Brundrett, and R. W. Wells (*U. S. Dept. Agr. Bul. 1369 (1926), pp. 120, figs. 38*).—This is a summary of information on *Hypoderma lineatum* De V. and *H. bovis* De G., based on studies conducted over a considerable period of time, preliminary accounts of which have

been noted (E. S. R., 35, p. 76; 47, p. 53; 52, p. 83). A review of the literature in connection with a list of 112 references is included.

Stomach and nodular worms in lambs (*Ohio Sta. Bul. 392 (1926), pp. 59–61, figs. 2*).—This is a report of control work with nematodes in lambs, in continuation of the work of the previous year (E. S. R., 53, p. 584). The results show that when lambs were kept on permanent pasture with infested ewes treatment with copper sulfate prevented stomach worm infestation; that keeping lambs in the barn with ewes until weaning, then continuously on clean rape forage, plus the copper sulfate treatment, prevented stomach worm infestation and nodular disease; that copper sulfate was a more efficient vermifuge than nicotine sulfate; and that the medicinal treatments as employed were of no value in preventing nodular worm infestation.

Enzootic hepatic cirrhosis of horses (walking disease) in the Pacific Northwest, J. W. Kalkus, H. A. Trippeer, and J. R. Fuller (*Jour. Amer. Vet. Med. Assoc., 68 (1925), No. 3, pp. 285–298, figs. 3*).—This is a contribution from the Washington Experiment Station on the hepatic cirrhosis of horses, which occurs enzootically in a number of districts in the Pacific Northwest. It is probably most prevalent in Walla Walla County, Wash., where the first recorded outbreak occurred over 30 years ago, when several hundred horses died. The authors deal with its history, occurrence, etiology, symptoms, anatomical changes, histological changes in the liver, course and prognosis, and treatment.

The nature of the disease, the character of the lesions, the fact that it is restricted to certain localities, and the apparent absence of infection all seem to indicate that the condition is most likely due to some dietary disturbance, or at least that it has its origin in the digestive tract. Many plants, chief among which are the lupines and tar weed (*Madia sativa*), are thought by the farmers to be possible causes. Intestinal worms in the cecum and colon have been considered by two of the authors to be a possible cause of hepatic cirrhosis, since in all cases autopsied various species of cylicostomes have been present in enormous numbers. The mortality is practically 100 per cent. Medicinal treatment of individual affected horses which show well-developed cases appears to be useless.

So-called salmon poisoning in dogs.—Progress report, C. R. Donham, B. T. Simms, and F. W. Miller (*Jour. Amer. Vet. Med. Assoc., 68 (1926), No. 6, pp. 701–715, figs. 4*).—The loss of dogs in western Oregon, northwestern California, and southwestern Washington after having eaten salmon or trout led to the investigations by the Oregon Experiment Station here reported. It was found that this so-called salmon poisoning in dogs and foxes is caused by a small intestinal fluke, which in the mature form burrows into the mucosa of the intestines of affected dogs and foxes. A cystic form of this parasite occurs in the muscles, kidney, liver, and gills of trout and fresh-water salmon, and is destroyed by cooking or prolonged freezing of the fish. Dogs that recover are immune and can eat parasitized fish with impunity, but this immunity has not been explained or transmitted. The complete life cycle of the fluke remains to be worked out.

A new genus and species of trematode, the probable cause of salmon poisoning in dogs, E. A. Chapin (*North Amer. Vet., 7 (1926), No. 4, pp. 36, 37, fig 1*).—Under the name *Nanophyes salmincola* the author describes a trematode representing a new genus and species. This was taken during investigations by Donham and Simms from dogs at Corvallis, Oreg., and is thought to be the cause of salmon poisoning in dogs in Oregon, Washington, and British Columbia.

Experiment with Mr. Thomas D. Wyatt's immunizing material against so-called salmon poisoning, B. T. Simms, C. R. Donham, and J. N. Shaw

(*Jour. Amer. Vet. Med. Assoc., 68 (1926), No. 6, p. 716*).—In tests made at the Oregon Experiment Station with Wyatt's immunizing material negative results were obtained.

[Diseases of poultry, etc.] (*Jour. Amer. Vet. Med. Assoc., 68 (1926), No. 5, pp. 549–559, 560–569, 570–580, 581–602, 603–630, 631–641, 642–652, 653–656, 657–663, figs. 14*).—Papers relating to diseases of domesticated fowl include the following: Fowl Pests in the United States, by J. R. Mohler (pp. 549–559); Fowl Pests, by E. L. Stubbs (pp. 560–569); Infectious Bronchitis of Fowls, by J. R. Beach (pp. 570–580); Avian Hemorrhagic Septicemia (Fowl Cholera), by J. W. Patton (pp. 581–602); Studies of *Salmonella pullora*, by R. E. Rebrassier (pp. 603–621); Neuritis in Chickens, by L. P. Doyle (pp. 622–630); Studies in Transmission of Bacillary White Diarrhea in Incubators, by W. R. Hinshaw, C. W. Upp, and J. M. Moore (pp. 631–641); *B[acillus] aertrycke* Infection in Canary Birds and Parrots (pp. 642, 643) and *B. aertrycke* as the Etiological Agent in a Disease Affecting Squabs (pp. 644–652), both by F. R. Beaudette; Plan for Handling Avian Tuberculosis, by T. E. Munce (pp. 653–656); and An Outbreak of Fowl Cholera [in the Philippines], by A. K. Gomez (pp. 657–663).

Hygiene and diseases of poultry (In *Second World's Poultry Congress and Exhibition. Barcelona: Graphic Art Co., 1924, pt. 2, pp. 203–250, fig. 1*).—Papers on this subject presented at the Second World's Poultry Congress (see page 165) include the following: Report on the Present State of the Researches on Avian Diseases at the Pasteur Institute of Paris, by Truche and Staub (pp. 205–211); Infectious Diseases of Poultry (pp. 212, 213); Food Stuffs and Avian Infections, by A. Lanfranchi and L. Sani (p. 214); Some Causes of Mortality in Poultry as Seen from Post-Mortem Examinations, by H. Smith (pp. 215–218); Combating Poultry Diseases by the State Serum Institute at Rotterdam, by B. J. C. te Hennepe (pp. 219–228); Paratyphoid Infection in Ducklings and Chicks, by E. Leynen (pp. 229–231); The Effects of Coccidiosis on Growing Stock, by J. W. Fuller (pp. 232, 233); The Vaccination Against Cholera and Typhus in the Poultry Fowls, by A. Lanfranchi (pp. 234, 235); The Mycoses of Back-Yard Animals, by M. Langeron (pp. 236–238); Trypanosomes Parasitic in Domestic Birds (p. 239) and Flagellated Intestinal Parasites Occurring in Domestic Birds (pp. 240, 241), both by G. Lavier; Parasitic Acari Affecting the Fowl: The Sarcoptidae, by F. Larrouse (pp. 242, 243); The Pathogenic Rôle of *Argas persicus*, by E. Brumpt (pp. 244–246); Argas in Tunis, by Cordier (pp. 247, 248); and The Prophylaxy of Intestinal Helminthiases among Poultry, by C. Joyeux (pp. 249, 250).

Coccidiosis in chicks (*Ohio Sta. Bul. 392 (1926), pp. 70, 71*).—In control work with avian coccidiosis healthy and infected chicks were kept together in one pen upon a floor of 1-in. poultry netting so elevated that the droppings would pass beyond reach of the chicks, and in another pen a similar group of chicks were kept on a cement floor covered with wood shavings. The death rate of infected chicks on the netting floor was 36 per cent; on cement 67 per cent; of healthy exposed chicks on netting floor 0, on cement 42 per cent.

The control of poultry lice and mites, S. MARCOVITCH (*Tennessee Sta. Circ. 2 (1926), pp. 2*).—In this practical account the author reports that the dust bath with fluosilicate (three parts of finely ground phosphate rock, or ordinary road dust, and one part of sodium fluosilicate) is a very simple method of freeing the farm flock from lice. Sodium fluosilicate was found superior to sodium fluoride in experiments conducted.

To control mites it is recommended that the roosts be sprayed every week, and the whole house every three months, with 5 gal. of kerosene to 1 pint of creosote, or with crude petroleum or old crankcase oil thinned with kerosene.

taking care to keep the birds out of the buildings until the material is well dried into the wood.

Kamala, a satisfactory anthelmintic for tapeworms in poultry, M. C. Hall and J. E. Shillinger (*North Amer. Vet., 7 (1926), Nos. 3, pp. 51–58; 4, pp. 52–56*).—Following a brief discussion of various treatments for tapeworms in poultry, the authors present the results of tests with arecoline hydrobromide and kamala. It was found that arecoline hydrobromide like most taeniafuges, is not valuable, at least in doses up to 0.25 grain, for removing tapeworms from chickens. A male fern proprietary is apparently effective against poultry tapeworms when used in large doses, but is expensive. Judging from the results of tests on 120 chickens and 6 turkeys, kamala is a satisfactory drug for this purpose. The therapeutic dose necessary to secure reasonably dependable action in removing tapeworms from chickens was 1 gm. per bird, the chickens used in the experiments weighing from about 1.5 to 3 or 4 lbs. Less than 1 gm. was inadequate, a dose of 0.5 gm. removing only about one-fourth of the tapeworms present.

AGRICULTURAL ENGINEERING

Annual report of the agricultural engineer, Central Provinces and Berar, for the year 1923–24, H. Copley (*Cent. Provs. and Berar [India] Dept. Agr., Agr. Col., Nagpur, Chem., Bot., and Mycol. Research [etc.] Rpt. 1923–24, pp. 23–32*).—A considerable amount of data is reported on plowing and tractor trials conducted in the provinces, together with miscellaneous data on well boring and other farm machinery.

Depth of drains for reclamation of irrigated lands, L. T. Jessup (*Agr. Engin., 7 (1926), No. 1, p. 13, fig. 1*).—In a contribution from the U. S. D. A. Bureau of Public Roads data showing the average depth of drainage systems installed on irrigated projects are graphically presented and briefly discussed. The depths range from 4 to nearly 9 ft.

A balanced cost schedule for tile trenching, H. B. Roe (*Agr. Engin., 7 (1926), No. 1, pp. 5–11, figs. 6*).—In a contribution from the Minnesota Experiment Station a schedule is developed from the trenching data on 18 farm drainage systems installed from 1908 to 1921. The schedule is based on a man-hour labor unit.

Studies of curing concrete in a semiarid climate, H. F. Gonnerman and C. L. McKesson (*Lewis Inst., Struct. Materials Research Lab. Bul. 15 (1925), pp. 37, figs. 13*).—Studies on the relative efficiency of various methods of curing concrete in a semiarid climate are reported. The experiments were conducted on 7 by 10 by 38-in. plain concrete beams made and cured in the open by five different methods. The investigation included transverse tests and tests for surface hardness on 518 beams and compression tests on 175 6 by 12-in. cylinders and prisms. The concrete was machine mixed in the proportion of 1:2.2:3. Calcium chloride was used as an admixture in 110 beams and 37 cylinders.

A curing method was found to be efficient which maintains the moisture content of the concrete during the early stages of hydration about equal to the original mixing water. Wet earth curing gave the best results of the methods used. This method apparently supplied moisture in sufficient quantity to replace losses due to evaporation and to absorption by the subgrade. Curing methods which permitted high evaporation losses gave concrete of low strength. Concrete cured under earth wet for 7 or 14 days was only slightly stronger than when cured under earth wet for 3 days. It is concluded that, with temperatures no lower than 70° F., concrete pavements cured by covering with wet

burlap for from 16 to 24 hours and then with earth kept wet for 7 days may be safely opened for traffic in 14 days.

Curing with a surface application of flake calcium chloride at the rate of 2.5 lbs. per square yard gave strength ratios of from 88 per cent at 7 days to 83 per cent at 90 days. There was a slight reduction in strength when more or less than this amount of calcium chloride was used. The strengths were reduced perceptibly when the calcium chloride was washed off after 3 hours. Washing off the calcium chloride after 1 day gave essentially the same strength as when left on the surface. The surface hardness of beams cured with calcium chloride was considerably less than that of beams cured with wet earth or asphaltic paper.

Beams molded and cured in concrete forms using calcium chloride at the rate of 2.5 lbs. per square yard showed strength ratios ranging from 100 per cent at 14 days to 89 per cent at 90 days. The strengths in this case were about 12 per cent higher than those of beams molded in wood forms and cured in the standard manner with a similar amount of calcium chloride. Asphaltic paper curing gave average strength ratios ranging from 92 per cent at 7 days to 78 per cent at 90 days, and the surface hardness was almost as high as for wet earth curing. Both air curing and sodium silicate curing produced low strength and surface hardness, the strength ratios ranging from about 77 per cent at 7 days to 74 per cent at 90 days.

Two per cent of calcium chloride added to concrete increased the flexural strength about 4 per cent at 3 days for air and calcium chloride curing, and gave no increase for wet earth curing. Calcium chloride, sodium silicate, and air curing produced a more friable surface than wet earth or paper curing.

Present status of the facts and theories of detonation, G. L. CLARK and W. C. THEE (*Indus. and Engin. Chem., 17 (1925), No. 12, pp. 1219–1226, figs. 2*).—An attempt is made to collect data bearing on the general phenomenon of detonation and the factors affecting it, and to make practical applications to the design and operation of internal-combustion engines. The present unsatisfactory status is ascribed to inexactness in the use of terms, to failure to make use of experiments of a purely scientific nature, to many diametrically opposite results by different investigators, to the need of more strictly quantitative data, and to the inherent great complexity of the subject.

Effects of knock inducers and suppressors upon gaseous ionization, G. L. CLARK, E. W. BRUGMANN, and W. C. THEE (*Indus. and Engin. Chem., 17 (1925), No. 12, pp. 1226–1229, figs. 2*).—Studies conducted at the Massachusetts Institute of Technology are reported which indicate that the theory of electron wave fronts in explosions and the absorption of electrons by knock suppressors is not sufficient to explain the practical operation of such chemical substances in the control of detonation in internal-combustion engines. Eight theories of the action of these compounds are critically considered, and new experiments suggested by this work are outlined.

Dust explosions in industrial plants, H. R. BROWN (*Indus. and Engin. Chem., 17 (1925), No. 9, pp. 902–904, figs. 3*).—In a contribution from the U. S. D. A. Bureau of Chemistry the characteristics of dust explosions in industrial plants are described, and methods for reducing the dust hazard are summarized.

Implements and machinery, R. G. ALLAN (*Cent. Provs. and Berar [India] Dept. Agr., Expt. Farm, Agr. Col., Nagpur, Rpt. 1923–24, pp. 1–3, 29–32*).—Data on tractor tests at the Nagpur College Farm are tabulated and briefly discussed.

Mapping the dust concentration around small tractors, A. H. HOFFMAN (*Agr. Engin., 7 (1926), No. 1, pp. 12, 13, figs. 3*).—In a contribution from the

California Experiment Station a simple method of mapping the distribution of dust around a tractor in use is described, and the results of tests on two tractors are briefly reported. Strips of bleached muslin were oiled slightly by being dipped into a light lubricating oil, and the cloths were fastened to light wooden frames which were mounted to the four corners of the tractor. The tests were made in a tilled field of fine sandy loam soil, the load being a spring tooth harrow.

The results indicate that in some tractors by proper placing of the air intake of the carburetor the amount of dust contended with may be reduced to perhaps less than one-tenth of what it would normally be.

Equipment for treating seed wheat, G. W. Kable (*Agr. Engin., 7 (1926), No. 1, pp. 14–16, figs. 10*).—In a contribution from the Oregon Agricultural College machinery for treating seed wheat with copper carbonate dust is described and illustrated. It is concluded that until some better method is discovered for controlling wheat smut, the copper carbonate treatment will be widely used. Apparently there are many types of machines which make a satisfactory application of this material. A few of the points which merit consideration, however, are the ability to apply a minimum quantity of copper carbonate dust in a uniform coating to the grain with the least amount of attendant dust and removal of the excess fungicide to prevent waste and undue wear of the seeding machinery.

Effects of various methods of applying fertilizers on crops and on certain soil conditions, D. G. Coe (*Soil Sci., 21 (1926), No. 1, pp. 7–21*).—Studies conducted at Iowa State College on methods and equipment for applying fertilizers on crops are reported.

The results showed that fertilizer applications located in direct contact with seed in the hill or in the drill row are likely to be very injurious to the best germination of the seed. Various factors such as rainfall, soil type, kind of seed, and kind of fertilizer were found to modify the injury produced. Very small amounts of concentrated, readily soluble chemical fertilizers were injurious, and these amounts were often smaller than the rates for which the fertilizer attachments upon available seeding machines could be adjusted.

Small applications of fertilizers produced retarded germination, and large applications caused inhibition of germination, the injury increasing directly with the fertilizer application. It is concluded, therefore, that for the best germination of all seeds under all conditions of climate and soil, the distribution of fertilizers in direct contact with the seed either in the hill or in the row is not advisable, and that planters with fertilizer attachments so designed as to cause such direct contact should be redesigned.

Other methods of localized distribution of fertilizers were found to be more promising. Locations above and below the hill or drill row were found to be inadvisable, however, because of a direct dependence upon climatic conditions and other variable factors. The side method of fertilizer distribution is considered to be the best solution of the problem for all crops sown in hills or rows with wide intervals between the successive rows.

A method of research as applied to a project on the air requirements of poultry, H. Giese (*Agr. Engin., 7 (1926), No. 1, pp. 20–24, 26*).—In a contribution from the Iowa Experiment Station a critical analysis is presented of the air requirements of poultry as a basis for a research project in the development of poultry housing equipment. The analysis is based upon a project now under way in the agricultural engineering division of the station. An extensive bibliography is appended.

The municipal sewage farm, Nagpur City, R. G. Allan (*Cent. Provs. and Berar [India] Dept. Agr., Expt. Farm, Agr. Col., Nagpur, Rpt. 1923–24, pp.*

33-35).—A brief description of this farm is given, together with data on the crops, yields, and receipts therefrom. It is noted that it was impossible to deal with all the sewage received on the limited experimental area. A certain amount of the excess was therefore run into lagoons on one corner of the farm during cold weather and allowed to precipitate. When this sludge dried out it developed into a valuable manure.

RURAL ECONOMICS AND SOCIOLOGY

An economic study of 270 farms in Union and Henderson Counties, W. D. NICHOLLS (*Kentucky Sta. Bul. 261* (*1925*), *pp. 135-153*).—The study reported here includes an analysis of the capital investment, crop acreage, livestock, farm receipts, expenses, and net income of 270 farms in Kentucky for the farm year 1923.

The net earning averaged $465, while those of the 12 best farmers averaged $3,058. Included in these amounts was the value of perquisites furnished by the farm for family use, the average value of which was $332 per farm. The average capital investment per farm, including the dwelling house, was $17,270 or exclusive of it $15,234. The average farm receipts were $2,995 per farm, including the cropper's share of the tobacco and other crops raised on the share. The average expenses were $1,616, including the value of the cropper's share of crops charged as cropper labor, depreciation on buildings and machinery, decrease in inventories of feeds and supplies, and unpaid family labor.

The factors which exerted the greatest influence on farm profits were (1) efficient labor utilization as measured by total labor accomplished per man, (2) control of expenses and low cost of production as measured by the ratio of expenses per $100 receipts, (3) volume of sales per 100 acres, (4) good crop yields, and (5) good returns from livestock, as measured by returns from livestock per dollar's worth of feed fed.

Progress report on cost of production route in Choctaw County, Mississippi, in 1924, J. N. LIPSCOMB and H. A. BYRD (*Mississippi Sta. Bul. 228* (*1925*), *pp. 13*).—This covers the first period of a projected three-year study of production costs on 25 farms comprising a cost of production route. These farms are representative of the upland section of the State and to some extent of that of the central and eastern sections of the Cotton Belt.

The average size was 120 acres, of which an average of 37.2 acres each was in crops and pastures and 45.6 acres were in woodland, waste, and farmstead. Of the area in crops 45.8 per cent was in cotton, 42.8 in corn, 3.4 in oats, and 7.8 per cent in lespedeza. The average cash receipts per farm were $909.09, including $86.56 as the average amount received for labor performed off the farm. Of the remainder, $480.05 was received from cotton and cotton seed and $342.48 from all other farm enterprises, including the sale of timber and crossties.

Cotton is the most important crop, and the quickest way to increase farm profits in this community is to improve cotton production practices. It is deemed inadvisable to use any considerable amount of land and labor for corn that could be used for cotton, unless the chances for 15 bu. of corn are as good as they are for 100 lbs. of lint cotton.

The labor and material requirements and yield per acre of cotton, corn, lespedeza hay, and oats and the unit requirements of 1 head of work stock, 1 dairy cow, and 1 hen, and for the production of 1 lb. of pork are tabulated.

Statistics of dry-land farming areas in Montana, H. E. SELBY (*Montana Sta. Bul. 185* (*1926*), *pp. 7, fig 1*).—Averages of estimates of farming conditions made by farmers in eight dry-farming areas in Montana for from one to three years, 1920-1922, are tabulated. These were years of less than average rain-

fall, as well as of severe agricultural panic and deflation, and the farm profits disclosed were very low, but in every area and in every year there were some farmers who made satisfactory incomes.

The economic lag of agriculture, C. D. Whetham (*Econ. Jour., 35 (1925), No. 140, pp. 536–557, figs. 4*).—Two English farms, one on light land in East Anglia and a grass dairy farm on heavy clay in western England, are dealt with here, as furnishing apt illustrations of the effect of lag on farmers' costs, the calculations being based on cash trading accounts solely. The total cash receipts and expenditures for the year ended September 29, 1924, were determined and analyzed and the economic factors which neither the farmers' skill nor luck may alter were isolated. Barley and milk were the most important products of these farms.

An average normal economic lag of 13.77 months is indicated for the first farm. A correction proportional to the rate of change in prices is applied, amounting to ±1.8 per cent for each fall or rise of 1 per cent per month in the level of prices or costs. On the second farm the lag proved to be 7 months, and this is corrected by —2.2 per cent on the basis of a rise of 165 points in costs in 6 years or by a correction of +2.8 per cent calculated on the basis of a fall of 102 points in 3 years.

The conclusion is that grass land involves less risk than arable farming, and that little may be done to diminish the lag in the latter. The lag increases the profits made while prices are rising, but it also exaggerates the losses incurred while prices are falling. In considering these tendencies in connection with national agricultural policy, the author points out that the mere caloric value of the food produced is greater on arable land, although a smaller portion of the more valuable digestible proteins in milk and meat are produced. The money returns per acre were about the same from the two farms studied here. Except as regards the mere quantity of food, the yield per acre is probably as high from grass as from arable land. It is obtained at less cost and at much less risk.

Report on the cost of production of maize investigation for the season 1922–23, E. Parish (*Union So. Africa Dept. Agr., Sci. Bul. 38 (1925), pp. 30, figs. 13*).—The investigation previously noted (E. S. R., 54, p. 80) was carried on for the later season, although results were obtained from only 30 farmers. Costs were much lower during 1922–23 than previously, owing in a measure to the fact that yields were considerably higher. The investment, costs of man and ox labor, and other items are tabulated showing the range and the average by provinces.

Profits and costs of storing corn, G. S. Shepherd and W. J. Hart (*Iowa Sta. Cur. Econ. Ser. Rpt. 1 (1925), pp. 22, figs. 5*).—A preliminary mimeographed summary is given of this aspect of a research project on the corn trade of Iowa. Statistics and general information have been assembled in a consideration of the costs of storage, the probable rise in the price of corn from early winter to the following summer, and the improvement in grade to be expected as a result of storage.

The conclusions are that storing corn in the crib until July or August in a bumper crop year will practically always result in a substantial gain to the holder. In a short crop year it usually involves a loss if only the cost of storage and the seasonal price are taken into account, but this may or may not be offset by the higher price received for the better grade. In normal crop years the costs of storage are usually roughly offset by the seasonal rise in price. The increase in price resulting from the improvement in grade is a net profit. In normal years, the lower the new corn grades in December below the grade it should make by the following summer the greater is the

ain to be expected from holding it. To the extent that the December grade s high, the reverse is true. Holding constitutes the final stage in the producion process, not speculation, but to the extent that storage until summer is nore generally practiced, the profit is reduced.

An economic study of the Massachusetts **apple industry**, H. W. Yount nd L. P. Jefferson (*Massachusetts Sta. Bul. 228 (1926), pp. 116, figs. 13*).—The station and a number of cooperating agencies made this study, in which nterviews were held with the owners of orchards in the State containing a ninimum of 100 bearing trees or smaller ones considered to have present or otential future commercial importance. Complete schedules were obtained rom 1,754, or 7 per cent of the total number of growers reporting apple trees n the census of 1925. These reported 45 per cent of the trees and 55 per ent of the production as given for the State in the Federal census of the same ear. Data are depicted in dot maps and bar charts to show the number and ge of trees, principal varieties, the size of bearing orchards, methods of sale, nd the extent of grading. The producing regions, orchard practices, prices, nd phases of marketing and distribution are described. The appendix (pp. 109–116) gives statistical material in 14 tables.

A growing demand for McIntosh apples is noted, and a larger quantity of this variety is reducing the sales of western apples on local markets. The growing of high-grade fruit will remain profitable, but owners, particularly of small orchards, are urged not to increase their plantings at least until the market situation has been adjusted.

The Christmas tree industry (*Ohio Sta. Bul. 392 (1926), pp. 79–81*).—In 1919 a plantation of about 0.25 acre was started at the station. The costs per acre of growing, cutting, and delivering 1,368 trees up to December 1925, amounted to $190.59, the total returns were $1,258.12, and net prof exclusive of interest charges and taxes, $1,067.53. Approximately 1,300 tr still remain. It is considered that more trees will be used in the future, that even at the rate of 25 cts. per tree, an acre of Christmas trees wo mean profits on land that might otherwise be idle, provided they can be m keted at Christmas time.

Cost of work horses on California farms, R. L. Adams (*California Bul. 401 (1926), pp. 3–20*).—A study of the cost of keeping 812 work horses 187 California farms in the year 1922 indicated that under the conditions ex ing at the time the average cost per animal per year amounted to $172.19. average on orchard and vineyard farms was found to be higher than on da and field crop farms, being $211.14 for the former group and $163.58 for latter group. Of the various items making up the cost of maintaining w horses, feed and chores are the two largest single costs. These amounted $112.32, or 68.9 per cent, for the dairy and field crop group and $162.16, or per cent, for the orchard and vineyard group. Feed costs for the period of study mostly ranged between $15 and $18 per ton for hay and $2.50 and $3 per horse-month for pasture, and were mostly $1.75 per 100 lbs. for grain. Other costs averaged 30.9 cts. per hour for choring, $1.62 for taxes, $5.01 for shoeing, veterinary, and similar miscellaneous minor items, $12.77 for shelter, and $6.66 for use of equipment. Credits (for colts and manure) were relatively small. Mortality averaged 5.1 per cent and depreciation 8.14 per cent. The number of hours that horses are used per year is the greatest single factor affecting cost per hour. Yearly use was found to range from 454 to 3,382 hours per horse, with a general average of 1,527 hours. The average cost per horsehour for time actually worked amounted to 11.08 cts., or approximately $1 per day for a 9-hour day.

Breeding cull ewes (*Ohio Sta. Bul. 392 (1926), pp. 61, 62*).—Forty-nine ewes culled from the station's breeding flock of high-grade and purebred Merinos were kept and bred for the production of spring lambs. They were sheared and sold with their lambs the following spring. Total debits amounted to $535.68 and total credits to $534.05, even though relatively high prices were realized for the lambs.

The cattle industries of the United States and Canada, L. G. CONNOR (*Washington: U. S. Tariff Comn., 1925, pp. IV+51, figs. 10*).—This report discusses the comparative production of these two countries, the status of the dominion surplus and its possible outlets, comparative prices, the effect of the tariff act of 1922 on these prices, the present situation in the domestic cattle-breeding region, which comprises Texas and the "range" States west and north, and the probable future developments affecting stockers and feeders.

Steps to Nebraska farm ownership, J. O. RANKIN (*Nebraska Sta. Bul. 210 (1926), pp. 32, figs. 5*).—This publication is based mainly upon a survey previously noted (E. S. R., 49, p. 189).

The farm tenancy stage has occurred more frequently in Nebraska than any other except the farm boy stage among the farmers studied; it has averaged nearly 10 years. Tenancy, farm labor for wages, rise in land value, and owner-operatorship of farms have been the most frequent sources of accumulation to the present generation of Nebraska farmers in the order named. Inheritance, gift, nonfarm labor, and other business have been important to much smaller numbers. Homesteading, nonfarm investment, and marriage are reported as sources of accumulation by very few. A quarter of all operators have been tenants on their fathers' farms, and 3 out of 5 have been share or share-cash tenants on Nebraska farms of others than their fathers. About 2 tenants out of every 3 expect to become owners; less than a sixth of all tenants studied already owned land. Nebraska farmers become landlords at an average age of 40 years, and retire at an average age of 50 years. Both assets and debts were several times as great at the time of becoming owner as at the time of becoming tenant.

Land reform in Mexico, G. BOLAÑOS V. (*Internatl. Rev. Agr. Econ. [Rome], n. ser., 3 (1925), No. 3, pp. 438–448*).—The institutions that have been set up and details of procedure under the law of January 6, 1915, are set forth.

Farm leases in Belgium, A. DELOS (*Internatl. Rev. Agr. Econ. [Rome], n. ser., 3 (1925), No. 3, pp. 389–437*).—The legal relations between owner and tenant as fixed by the lease are set forth in these pages in a discussion of inventory; the period of the lease; rent; the seasons and conditions for taking up a lease; customs as to the reduction of rent in the case of unforeseen accidents; indemnity for improvements; subletting; sale or removal of straw, forage crops, and manure; notices of expiration of the lease; restrictive clauses; and reform of legal regulation of farm leases. The situation as regards the handing down of legal decisions is discussed. Examples are given of leases with a sliding scale of rent.

Commodity market terms, C. MAUGHAN (*London: Effingham Wilson, 1925, pp. XXXI+305*).—Definitions of the distinctive terms in use in trading in grain, other foodstuffs, seeds, and vegetable oils (pp. 1–63) and textiles and fibers (pp. 132–212) are presented in this volume, with information as to their technical use.

Direct-to-consumer marketing of farm products, F. L. THOMSEN (*Missouri Sta. Circ. 143 (1926), pp. 4*).—Certain advantages of direct marketing are outlined, types are described, and suggestions are offered as to effective methods of advertising.

Large peach crop calls for organized marketing, J. W. Lloyd (*Illinois Sta. Circ. 307 (1926), pp. 4*).—The organization of cooperatives for the purpose of marketing the Illinois peach crop, which is expected to be twice as large in 1926 as ever before, is strongly recommended. The function of a local association is outlined, and suggestions are offered regarding the formation of one, by-laws, the filing of articles of incorporation, and the selection of a sales agency.

Marketing peanuts, H. J. Clay and P. M. Williams (*U. S. Dept. Agr. Bul. 1401 (1926), pp. 99, figs. 41*).—An introductory historical sketch of the development of peanut production in the Cotton Belt and a description of leading varieties and commercial types of peanuts are given. The operations of harvesting and curing and picking or threshing, as well as the way in which production is financed, marketing methods, secondary distribution, Federal market news reports, the sale of roasted peanuts in the shell, and the manufacture of peanut products, are described. The growing of peanuts as feed for hogs is noted, and imports and exports are discussed. Suggestions with regard to increasing sales and improving the industry are offered, and statistical information is tabulated.

Hedging by dealing in grain futures, G. W. Hoffman (*Thesis, Univ. Penn., Philadelphia, 1925, pp. 141, figs. 4*).—Hedging as dealt with here has been limited to the American grain trade and to the use of futures contracts on organized exchanges. The history of the devolpment of this practice is traced, the process and the more important factors influencing it are explained, technical aspects are presented with consideration of its limitations, and the extent to whch it is practiced is measured both by its use by each interest in the trade and by an estimate of the extent to which the grain crop is hedged as it moves from the producer to the ultimate consumer during the course of the crop year. The final chapter is concerned with the insurance feature, emphasizing the importance of the shifting of risk due to price changes to a class whose primary business is the assumption of risks.

The disposition of American wheat supplies, A. E. Taylor (*Wheat Studies, Food Research Inst. [Stanford Univ.], 1 (1925), No. 9, pp. 289–326*).—These pages present an appraisal of statistics of wheat supplies, measures of the disappearance and consumption of wheat, data on flour milling, seasonal variations in flour output and export, and other items. Many of the procedures now employed are regarded as technically inadequate and incomplete, and suggestions are offered for the amplification and perfection of them.

International trade in wheat and wheat flour, J. A. LeClerc (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Trade Prom. Ser. No. 10 (1925), pp. XII+290, figs. 51*).—A detailed statistical study of the world's trade in these products from 1909, including the latest available statistics, is presented. Detailed tables are given showing the destination of exports and the sources of imports for all the countries of the world whose trade in wheat and flour is of importance. The data have been compiled from original sources and converted from the original units into bushels of grain and barrels of flour. The material is discussed under the heads of production, exports of wheat and flour, wheat grain shipments, international movement of wheat, flour shipments, combined wheat and flour shipments, grain trade by countries, comparison of imports and exports, and consumption of wheat.

The Mexican market for United States foodstuffs, L. A. Wheeler (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Trade Inform. Bul. 380 (1925), pp. II+28*).—Statistics on the exports of foodstuffs to Mexico from the United States, as well as the Mexican imports of these products from all countries, are presented. The matters of trade regions, import duties, methods of adver-

tising food products in Mexico, and the organization of the Mexican market for certain groups of foodstuffs are also discussed.

Report on the trade in refrigerated beef, mutton, and lamb ([Gt. Brit.] *Min. Agr. and Fisheries, Econ. Ser. 6 (1925), pp. VI+65, pls. 5, figs. 4*).—One of the series previously noted (E. S. R., 54, p. 484), this report constitutes a descriptive summary covering statistical and historical phases of the marketing and disposition of meat in Great Britain; the present sources of supply; the trade organization of Australian, New Zealand, and South American firms; types of sale and other matters associated with the trade in Great Britain; and the combinations in the industry.

Crops and Markets [April–May, 1926] (*U. S. Dept. Agr., Crops and Markets, 5 (1926), Nos. 14, pp. 209–224; 15, pp. 225–240; 16, pp. 241–256; 17, pp. 257–272; 18, pp. 273–288; 19, pp. 289–304; 20, pp. 305–320; 21, pp. 321–336; 22, pp. 337–352*).—These numbers give the usual abstracts of the situation in the week's market of important classes of agricultural commodities. Brief articles, with tabulations. cover in some detail the trade in and prices received for certain products, and notes are offered on the foreign crops and markets situation.

Monthly Supplement to Crops and Markets [April, 1926] (*U. S. Dept. Agr., Crops and Markets, 3 (1926), Sup. 4, pp. 105–136, figs. 7*).—Data showing crop conditions; production and marketing; the receipts, disposition, and prices of livestock and livestock products; tabulated statistics of the farm labor, supplies, and wages; cold storage holdings, shipments of fruits and vegetables, and other items; and reviews of world agriculture, March 15 to April 15, 1926, and of the current price situation are presented in this number, together with a summary of farm prices and income and general business conditions since 1920.

Monthly Supplement to Crops and Markets [May, 1926] (*U. S. Dept. Agr., Crops and Markets, 3 (1926), Sup. 5, pp. 137–160, figs. 3*).—This number presents the reports on crop conditions for May 1, 1926, together with the usual current data, with comparisons, showing estimated farm prices, livestock and meat receipts and disposition and inspection, shipments of fruits and vegetables, cold storage holdings, and other items. The review of world agriculture, April 15 to May 15, 1926, is given, as is also the analysis, with graphs of the current price situation.

Factors affecting prices: A selected bibliography, including some references on the theory and practice of price analysis, compiled by L. O. Bercaw (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 14 (1926), pp. IV+40*).—This is a mimeographed list of recent studies in the economic-statistical analysis of prices, particularly in the field of agriculture. Some references to business and generating cycles and methods have been included.

Agricultural co-operation in Poland, Z. Chmielewski and W. Wilczewski (*Internatl. Rev. Agr. Econ. [Rome], n. ser., 3 (1925), No. 3, pp. 499–517*).—The history and the present status of the agricultural cooperative movement in Poland are reviewed.

Land reclamation and land improvement in the Netherlands, J. P. Van Lonkhuyzen (*Internatl. Rev. Agr. Econ. [Rome], n. ser., 3 (1925), No. 3, pp. 449–478, figs. 4*).—The history of land drainage is reviewed in considerable detail.

A history of Connecticut agriculture, E. H. Jenkins (*Connecticut State Sta. [Pub., 1926], pp. 289–425*).—This is an account of the development of the art of farming in Connecticut from colonization to about 1880.

The year ahead in Iowa agriculture, C. L. Holmes (*Iowa Sta. Cur. Econ. Ser. Rpt. 2 (1926), pp. 3–23*).—This is an interpretation of the outlook report of the U. S. Department of Agriculture (E. S. R., 54, p. 884), with particular reference to the probable effect of the general situation upon the outlook for Iowa. Attention is given to the supplies to be expected in 1926 of corn, hogs, beef cattle, dairy products, and work stock, particularly as they may be expected to react upon prices and markets for Iowa products.

The social composition of the rural population of the United States, L. S. Cressman (*New York: George H. Doran Co., 1925, pp. IX+13–67*).—An analysis of 1920 census data assembled in special tabulations for the study previously noted (E. S. R., 54, p. 886) is presented here. In addition the author has compiled tables showing the marital conditions by 10-year age periods and the distribution of the population by age periods for 155 of the original 177 villages. The source tables are given here, and the conclusions are briefly summarized indicating the nature of the rural population. It is shown that the "total rural," which has generally been treated as a single homogeneous section of the population, consists of two quite distinct classes, the village and the open country population.

Rural migration: Its explanation and means of preventing it through agrarian reform, M. Hainisch (*Die Landflucht: Ihr Wesen und Ihre Bekämpfung in Rahmen einer Agrarreform. Jena: Gustav Fischer, 1924, pp. X+371*).—Much of the literature dealing with the problem of rural depopulation in Germany and in certain other countries is reviewed, and the circumstances inducing the migration of agricultural laborers and small owners to the city in response to the high wages to be received are pointed out. It is held that the causes of such migration are largely economic, and that it is not the result of demands for easier and better living conditions and social pleasure. The remedy suggested is based upon State measures to control or fix land values and prevent overcapitalization in agriculture. If less of the farm income were required to meet the charge of interest on capital, the industry could afford higher wages for labor.

Number of farms by States and counties, 1925, 1920, 1910, and 1900 (*U. S. Bur. of the Census, U. S. Census Agr., 1925, pp. 32, fig. 1*).—Some preliminary data from the United States census of agriculture for 1925 are presented here, with comparisons.

Alabama: An index to the State official sources of agricultural statistics, compiled by M. T. Olcott (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 15 (1926), pp. III+96*).—This is one of a projected series, in mimeographed form, of source books of State agricultural statistics. Publications are listed under the heads of the principal crops and commodities.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Crop production data.—Farm crops, H. D. Hughes and E. R. Henson (*Ames: Iowa State Col., Farm Crops and Soils Dept., 1925, pp. 258, figs. 32*).—Data bearing upon certain crop production problems have been assembled in 23 chapters for use as teaching material in classes in farm crops.

Arbor Day program for rural schools, C. P. Halligan (*Michigan Sta. Circ. 91 (1926), pp. 4, fig. 1*).—Suggestions for planning the school grounds, rules for planting trees and shrubs, and a list of common native plants are provided, together with a program of events for Arbor Day and an appropriate quotation for use on such an occasion.

FOODS—HUMAN NUTRITION

Applied chemistry.—II, Foods, C. K. TINKLER and H. MASTERS (*London: Crosby Lockwood & Son, 1925, vol. 2, pp. XI+276, pls. 4, figs. 19*).—This is the concluding volume in the series previously noted (E. S. R., 45, p. 201). The subjects dealt with are milk; edible oils and fats; carbohydrate foods; raising agents; meat, meat extracts, etc.; vinegar, fruit juices, and vegetable acids; beverages; the preservation of food; poisonous metals in foods; the cooking of foods, condiments, etc.; and the calorific value of foods.

Food and the family, V. H. MOTTRAM (*London: Nisbet & Co., 1925, pp. XIII+15–240, figs. 3*).—"The main function of this book is to present to the lay reader, in terms as intelligible as they may be made, the broad outlines of the results of modern scientific research into the values of foodstuffs, with especial reference to economy in food compatible with health."

Selected list of Government publications on food and nutrition, compiled by R. VAN DEMAN (*U. S. Dept. Agr., Bur. Home Econ., 1926, rev., pp. 1+36*).—Nearly 200 available Government publications touching on various phases of food and nutrition of interest to home economics workers are noted in this mimeographed list, a revision of one issued in 1923 (E. S. R., 61, p. 196).

Nutrition laboratory, F. G. BENEDICT (*Carnegie Inst. Wash. Yearbook 24 (1924–25), pp. 127–136*).—This annual report contains, as previously (E. S. R., 53, p. 364), a brief outline of investigations in progress and abstracts of publications of the laboratory during the year, several of which have been noted from their original sources.

A survey of food habits in a Hungarian mining town, I. H. GROSS (*Jour. Home Econ., 17 (1925), No. 6, pp. 315–321*).—This is a general discussion of the native dietary habits of the Magyars, as based upon interviews with 53 families in the Hungarian mining town of Tatabánya. It is considered that the diets probably furnished sufficient energy, protein, iron, vitamins B and C, and cellulose, but were low in calcium, phosphorus, and vitamin A.

Nutritive value of the protein in veal and calf sweetbreads; in beef cheek meat, lips, tongues, brains, spleen, and tripe, and in hog brains and tongues, R. HOAGLAND and G. G. SNIDER (*Jour. Agr. Research [U. S.], 32 (1926), No. 7, pp. 679–688*).—In this investigation the nutritive value of the proteins of the various meat products listed was calculated from the gains in weight per gram of protein fed of young rats kept for 30, and later 60 days on a suitable ration containing 10, and in some cases 12.5 or 20 per cent of the protein in question. From 4 to 6 rats were used for each determination.

The average weight gains in grams per gram of protein fed at a 10 per cent level for 30 and 60 days, respectively, were as follows: Veal 2.88 and 2.35, ox brain 2.97 and 2.46, hog brain 2.89 and 2.32, ox tongue 2.85 and 2.28, hog tongue 2.86 and 2.26, thymus 1.81 and 1.63, beef cheek meat 2.36 and 2.13, ox lips 2.29 and 1.81, and ox spleen 2.75 and 2.33 gm. Compared with this, dried partly skimmed milk gave values of 2.89 and 2.36, ox muscle 3.15 and 2.55, hog muscle 2.96 and 2.46, and sheep muscle 3.12 and 2.48 gm.

A few of the samples were fed at a 12.5 per cent level, with results for 30- and 60-day periods as follows: Veal 2.90 and 2.10, beef cheek meat 2.56 and 2.02, and ox lips 2.41 and 1.94 gm. Tripe was tested at a 12.5 per cent level for 30 days and at a 20 per cent level for 30 and 60 days, with results of 1.16, 1.27, and 0.92 gm., respectively.

These values indicate that ox and hog brains, ox and hog tongues, and ox spleen correspond in nutritive value to muscle tissue and milk and are much higher than sweetbreads, tripe, beef cheek meat, and ox lips. The low values

ror sweetbreads and tripe are thought to be due to a deficiency in one or more of the essential amino acids.

Continuation and extension of work on vegetable proteins, T. B. Osborne and L. B. Mendel (*Carnegie Inst. Wash. Yearbook 24 (1924-25), pp. 349-354*).—This is the annual progress report (E. S. R., 53, p. 364) of the work of the authors and their associates on various nutritional problems, including an extension of the studies on the dietary essentials for maximal growth and on the effects of high protein diets upon the kidney, the work of Mason on testicular development and degeneration in relation to diet noted on page 194, methods of analyzing products of protein hydrolysis (E. S. R., 52, p. 803), and the continuation by Vickery and Vinson of the studies on the nitrogenous substances of the alfalfa plant (E. S. R., 54, p. 408).

Attention is called to the significance of the problem of maximal v. ordinary growth, not only in physiology but in practical agriculture. It is noted that while rats on a stock diet of commercial dog biscuits and occasional vegetables gained in body weight from 60 to 200 gm. in an average of 67 days, on certain selected synthetic rations with suitable supplements equal gains were made in 28 days or less.

Baking bread, using only the panary fermentation, or mechanical modification of dough, C. O. Swanson and E. B. Working (*Northwest. Miller, 145 (1926), No. 4, pp. 332, 355, 356, figs. 6*).—A mechanical dough mixer by means which it is said to be possible to produce a dough capable of making a light bread with only panary fermentation is described and illustrated. The mixer is said to act on the dough "in a pack-squeeze-pull-tear fashion. The pack and squeeze action causes the gluten particles to adhere to each other, forming strands; the pulling elongates these strands and effects through intermingling of the starch and gluten particles with the yeast and other ingredients in the dough, the result being a gluten network permeating the entire dough mass. The tear action partly breaks down the gluten colloid complexes, and so causes a modification of dough quality."

Canning fruits and vegetables at home, L. Stanley (*U. S. Dept. Agr., Farmers' Bul. 1471 (1926), pp. II+22, figs. 17*).—In this publication, which supersedes Farmers' Bulletin 1211 (E. S. R., 46, p. 208), a discussion of the causes of food spoilage, time and temperature required for destroying bacteria, and types of home canners and containers furnishes the background for specific directions for canning fruits and vegetables. The water bath method is recommended for fruits, tomatoes, pickled beets, and pimentos and the pressure canner for nonacid vegetables. In canning by the water bath method, emphasis is placed on the hot pack method as combining the advantages of the open kettle and the cold pack methods and doing away with the disadvantages of the latter. The reason for recommending without qualification the steam pressure canner for nonacid vegetables is stated as follows:

"Because of spoilage difficulties and the risk of poisoning from occasional contamination with botulinus bacteria when nonacid vegetables are canned by the water bath method, the department recommends the canning of such vegetables with the steam pressure canner. Where it is not practicable to use the steam pressure canner, times and methods to be used should be obtained from the specialist at the State college of agriculture." Concise directions, with time-tables, are given for canning specific fruits and vegetables by the recommended methods.

Solubility experiments with cooking utensil metals and the determination of dissolved metals [trans. title], **K. K. Järvinen** (*Ztschr. Untersuch. Nahr. u. Genussmtl., 50 (1925), No. 3, pp. 221-225*).—In the study reported the solvent action on cooking utensils of 1 per cent hydrochloric acid, 5 per cent

sodium chloride, and a solution of 400 gm. sugar and 15 gm. citric acid in 1 liter was studied by heating pieces of the metal in the solution for 3 hours at 100° C. Instead of heating the solutions in the utensils as in a previously reported study (E. S. R., 50, p. 763), the methods for determining the various metals in solution were in general the colorimetric methods earlier described (E. S. R., 50, p. 613). The results are reported in tabular form and compared with those previously obtained.

Iron and copper were dissolved to a much smaller extent than in the previous study. The sugar solution had a greater solvent action than the salt solution and dissolved more iron, aluminum, zinc, nickel, and tin from the sheet metals than from alloys. The physical properties of the metals and the presence of small amounts of impurities affected the solubility. Chrome iron alloys were very insoluble.

Intestinal chemistry.—III, Salivary digestion in the human stomach and intestines, O. Bergeim (*Arch. Int. Med., 37 (1926), No. 1, pp. 110–117*).—In continuation of the studies previously noted (E. S. R., 52, p. 862), the extent of salivary digestion in the human stomach was determined by the use of the retention stomach tube. After test meals of 100-gm. portions of boiled and mashed potatoes or 75-gm. portions of bread without crust, 3.7-cc. samples of the gastric contents were removed at 15-minute intervals, starting 15 minutes after the last of the test meal had been swallowed. Portions of these samples were tested for free HCl, active amylase, and degree of starch digestion.

As judged by the data obtained for six subjects on each of the test meals, an average of 76 per cent of the starch of the mashed potatoes and 59 of that of bread was converted to maltose and an additional amount to dextrins by salivary digestion in the stomach. The starch conversion was generally brought about within from 15 to 30 minutes after the meal was finished, free hydrochloric acid appearing simultaneously with the disappearance of active amylase. It was also demonstrated that salivary amylase is inactivated by low concentrations of free hydrochloric acid even in the presence of starch and its digestion products, and is not reactivated by neutralization of the acidity or by the addition of small amounts of active amylase.

Cholesterol synthesis in the animal body, H. J. Channon (*Biochem. Jour., 19 (1925), No. 3, pp. 424–432, figs. 3*).—Sources of error in the various methods which have hitherto been used in attempts to determine whether or not the animal body is capable of synthesizing cholesterol are pointed out, and the report is given of a study along somewhat different lines, the general plan being to determine the relation between the body weight and the cholesterol content of rats at various periods up to 150 gm. in weight when maintained on a complete diet, a diet completely free from cholesterol, and a diet low in cholesterol. The complete diet was that of Drummond and Coward (E. S. R., 44, p. 764). In the cholesterol-free diet the butter and the lemon juice of the complete diet were omitted, and 0.0005 gm. daily was given of the unsaponifiable fraction of cod-liver oil from which the cholesterol had been removed by precipitation with digitonin. The third diet was the same as the second, with the addition of 0.004 gm. daily of cholesterol.

From the data obtained on the complete diet, curves were constructed using the weight of the rat in grams or age in weeks as abscissas and the cholesterol content in milligrams as ordinates. At weaning the cholesterol content was about 100 mg. The first curve showed a linear relationship between cholesterol content and body weight, with a much more marked increase in cholesterol in the early stages. The second curve showed a rapid increase in the percentage of cholesterol up to an age of 3 weeks, followed by a drop to

values slightly above that at birth. Rats fed on a cholesterol-free diet from weaning until they had reached 100 gm. in weight showed an increase in cholesterol content from 100 to 200 mg. Compared with this, the average cholesterol content of the bodies of rats fed the same length of time on the third diet was 219 mg. This would appear to indicate that the animal body is capable of synthesizing cholesterol. From data on the cholesterol content of the feces of rats on the cholesterol-free diet, it was estimated that the total cholesterol synthesized was 0.24 gm. by each animal in 6 weeks.

Studies on cholesterol.—I, Synthesis of cholesterol in the animal body, F. S. Randles and A. Knudson (*Jour. Biol. Chem., 66 (1925), No. 2, pp. 459–466*).—The literature on cholesterol synthesis by the animal body is reviewed briefly, with the comment that with the exception of the investigation by Channon, noted above, no one has used diets free from cholesterol and at the same time adequate for maintenance or growth nor have the experimental animals been carried over more than one generation. In the investigation reported these points have been kept in mind.

In the first series of studies 8 rats were placed at weaning on a cholesterol-free diet consisting of alcohol-extracted casein 18, cornstarch 58, extracted alfalfa 15, McCollum's salt mixture 185 4, and yeast extract (Vegex) 5 per cent. The alfalfa was extracted with ether in the cold for the purpose of removing any sterols without removing all of the vitamin A. That the diet contained no appreciable amounts of cholesterol was shown by the failure of a 24-hour ether extract of the diet to give a qualitative test for cholesterol by either the colorimetric or the digitonin method. Four other rats received the same diet plus 0.05 per cent cholesterol, and later others were started on diets containing 0.025 and 0.1 per cent of added cholesterol. At 5 months of age samples of blood were taken, after which the animals were killed and their livers, brains, and blood analyzed for cholesterol by the colorimetric method. In addition data were obtained on the cholesterol content of 1-day-old offspring of some of the rats on the various diets and on the total cholesterol content (exclusive of head, skin, and viscera) of 9-month-old rats maintained from weaning on the various diets.

No significant differences were found in the cholesterol content of the animals on the various diets. The average cholesterol content of the entire body of the day-old rats weighing 5 gm. was 5.5 mg., while in the brains alone of others born and kept on the cholesterol-free diet until 5 months old the content was from 21 to 24 mg. The total cholesterol content of the bodies of the 9-months-old rats on the various diets was as follows: Cholesterol-free 0.094, stock ration 0.106, and cholesterol-free plus 0.025 per cent cholesterol 0.124 per cent.

These results substantiate those of Channon as indicating cholesterol synthesis by the rat.

Studies on the occurrence and significance of the vitamin A group [trans. title] G. von Wendt (*Klin. Wchnschr., 4 (1925), No. 50, pp. 2389, 2390*).—In this general discussion of the sources of fat-soluble vitamins in the diet of the people of Finland, attention is called to the general lack of vitamin A during the winter months, and this is suggested as a possible explanation for the longer growth period in Finland than in other European countries where there is a more abundant supply of vitamin A. It is stated that in general growth continues for 4 or 5 years longer, and that in the twenty-first year the average increase in height is 10 mm. in Finland as compared with 1 mm. as the general average in Europe. From measurements of more than 15,000 children from the ages of 11 to 16 years, a table was prepared of the increase in height and weight of boys and girls in three periods from October to Janu-

ary, February to May, and June to September, inclusive. The increases in height for these periods were boys 18.2 and girls 16.1 mm., 16.3 and 14.8, and 19.6 and 16.4 mm., respectively, and in weight 1.74 and 1.63, 1.21 and 0.97, and 1.48 and 1.59 kg., respectively.

Changes in the percentage of A-vitamine and in the nature of albumen during the germination of katjang-idjoe (Phaseolus radiatus L.), W. F. DONATH (*Meded. Burgerl. Geneesk. Dienst Nederland. Indië, No. 4 (1924), pp. 344–362, pls. 7*).—Further evidence on the synthesis of vitamin A in plants is afforded by this paper in which it is reported that, while katjang-idjoe (*P. radiatus*) is insufficient as a source of vitamin A for growing rats in amounts equivalent to 20 per cent of the ration, dried tao-geh (the 4- to 5-day-old sprouts of katjang-idjoe grown in diffuse light) is sufficient in proportion of 10 per cent, and sprouts grown for from 7 to 8 days in the sunlight in amounts as small as 1 per cent of the ration calculated on the dried substance. The vitamin appears to be concentrated in the leaves and stems and to be entirely absent from the roots.

Vitamin A in oleo oil and oleo stearin, R. HOAGLAND and G. G. SNIDER (*Jour. Agr. Research [U. S.], 32 (1926), No. 5, pp. 397–416, figs. 27*).—Data are reported from the Bureau of Animal Industry, U. S. D. A., on the vitamin A value of 24 samples of oleo oil and 8 of oleo stearin obtained from various commercial meat-packing plants. The materials to be tested were incorporated in a basal vitamin A-free ration to the extent of 10 and 20 per cent of the ration. Young rats were placed at weaning on these rations without any preliminary period on the basal ration. The extent of growth which would have resulted on the basal ration alone as the result of previous storage of the vitamin was estimated by comparison with growth curves of other young rats from the same stock and kept on the basal ration alone.

Of the various oils tested, 20 per cent in some cases furnished sufficient vitamin A for normal, and in others for somewhat subnormal growth. A few samples of yellow oil furnished sufficient vitamin A when fed to the extent of only 10 per cent of the ration. The oleo stearin contained less vitamin A than the oil, and the yellow stearin was richer than the white. No constant relationship was shown, however, between color and content of vitamin A, for a colorless sample of mutton oleo oil was richer in vitamin A than some of the light yellow oleo oils.

"As compared with the other commercial food fats and oils, oleo oil ranks below butter but ahead of lard and the vegetable fats and oils as a source of vitamin A."

Determination of glucose, nonprotein nitrogen, uric acid, and total phosphorus in the blood of healthy men living in the Tropics and in that of birds suffering from avitaminosis [trans. title], P. J. TEDING VAN BERKHOUT (*Meded. Burgerl. Geneesk. Dienst Nederland. Indië, No. 4 (1924), pp. 326–343*).—This investigation, which was carried out at Batavia, Java, was undertaken as a starting point for determining a definite criterion for the condition of hypoavitaminosis in human beings before the appearance of definite symptoms of beriberi. The subjects included Europeans and Malays, healthy cocks and pigeons, and cocks and pigeons suffering from polyneuritis. The reducing power of the blood was determined by the methods of McLean (slightly modified), Folin and Wu, and Hagedorn and Jensen; nonprotein nitrogen by the colorimetric method of Myers; uric acid by the most recent methods of Folin and of Benedict; and phosphorus by the gravimetric method of Embden and the volumetric method of Neumann. The blood samples varied from 0.1 to 1 cc.

The values for reducing sugar, nonprotein nitrogen, and uric acid in the healthy human subjects fell within the established range for temperate regions, but those for phosphorus were slightly higher than the accepted standards. The values for reducing sugar, nonprotein nitrogen, and total phosphorus in the blood of polyneuritic cocks were within normal limits. In 8 out of 14 polyneuritic pigeons a pronounced hypoglycemia was observed, but contrary to the results reported by Collazo (E. S. R., 49, p. 565) this was not followed by hyperglycemia. The hypoglycemia did not appear with sufficient regularity to attribute to it a diagnostic significance in the evolution of the disease.

The content of milk in antiscorbutic substances [trans. title], A. FRANK (*Klin. Wchnschr.*, *4* (*1925*), *No. 25*, *pp. 1204–1208*, *figs. 5*).—Following the report of Meyer and Nassau on the antiscorbutic value of market milk sold in Berlin (E. S. R., 53, p. 265), the author undertook a similar study of milk sold in Leipzig and also of samples of human milk and goat's milk. Two guinea pigs were used for each sample of milk tested, and no statement is given as to the basal ration which was presumably oats.

No protection against loss in weight and death was given by breast milk and goat's milk. One of the two animals on a special baby milk and on ordinary market milk, respectively, died and the other survived but did not gain in weight. Both animals on the sample of special cow's milk survived. In view of the amount of infantile scurvy in Leipzig, the author draws the conclusion that guinea pigs are not suitable animals for testing the antiscorbutic properties of food from the point of view of human scurvy.

The vitamin content of human milk [trans. title], L. F. MEYER and E. NASSAU (*Klin. Wchnschr.*, *4* (*1925*), *No. 50*, *pp. 2380–2383*, *figs. 8*).—In a study similar to that of Frank noted above, the authors found that while a diet of fresh oats and human milk in amounts of from 50 to 70 gm. daily was insufficient to keep guinea pigs alive for more than 63 days, the deficiency was not that of vitamin C but of protein. None of the animals which succumbed showed signs of scurvy before death or on histological examination of the bones. On supplementing the oats and milk with plasmon, a protein preparation not containing vitamin C, normal growth took place.

Variations in the antiscorbutic properties of dry milk, G. C. SUPPLEE and O. D. DOW (*Amer. Jour. Diseases Children*, *31* (*1926*), *No. 1*, *pp. 41–50*, *figs. 7*).—The literature on the antiscorbutic properties of dried milk is reviewed, and additional data are reported on the antiscorbutic value of spray process milk as purchased in the open market in sealed tin containers and of roller process powder freshly prepared in the fall and kept in sealed tins at room temperature for 2 years before being tested.

Two different basal rations were used in testing the spray process milk, but with little variation in results. All of the animals receiving 40 cc. of reconstituted milk developed scurvy, and definite but not complete protection was secured with 90 cc. With the roller process milk scurvy developed in most cases on 50 cc. but was prevented by 80 cc. Since the powder was stored in tins containing air, the conclusion is drawn that in the roller process milk "there was little or no diminution of the antiscorbutic factor as a result of desiccation or oxidation during the long storage period."

New studies on the relation between age and the appearance of scurvy [trans. title], G. MOURIQUAND and M. BERNHEIM (*Compt. Rend. Acad. Sci.* [*Paris*], *181* (*1925*), *No. 25*, *pp. 1103, 1104*).—Data are reported on the time of onset of scurvy as judged by sensitiveness in the joints and crepitation in guinea pigs weighing from 70 to 200, from 200 to 400, and from 600 to 800 gm. when placed on the scorbutic ration of barley and hay.

The minimum, maximum, and average number of days before the appearance of sensitiveness for 10 animals in the successive groups were as follows: 11, 14, and 13 days, 6, 9, and 7.5 days, and 13, 23, and 16.3 days, and, for the appearance of crepitation 16, 23, and 19 days, 13, 16, and 14.8 days, and 23, 30, and 25.7 days, respectively. These findings agree with those observed in human scurvy that for a certain time after birth (up to about 6 months in babies) there is an even slighter susceptibilty to scurvy than in adults.

The prevention of scurvy in the navy, J. L. Priston (*Jour. Roy. Naval Med. Serv., 12 (1926), No. 1, pp. 1–20*).—This paper contains a critical review of the various measures which have been taken by the British Admiralty to prevent scurvy in the navy and of attempts to prepare concentrated antiscorbutics for such purposes. This is followed by a description of an investigation of the antiscorbutic value under varying storage conditions of concentrated orange juice manufactured in California by evaporating the juice at 37° C. under a vacuum of 28 in. of mercury, adding sufficient sugar to make 16 per cent of the final product, and evaporating to one-sixth or one-seventh the bulk of the orange juice.

The tests were conducted on guinea pigs which had been kept for 10 days on a basal diet of oatmeal 1, bran 2, and whole dried milk heated to destroy vitamin C 4 parts. In the first series of experiments the concentrated juice which had been kept for from 10 to 16 weeks at warehouse temperature and from 5 to 24 weeks in the ice box at about 8° C. was protective in 3 out of 4 cases in a dosage of 0.3 cc. or about one-third of the amount required of fresh orange juice. Longer storage at ice box temperature did not reduce the potency to any marked extent, but storage for 42 weeks at 19° reduced the potency to about one-third, and for 24 weeks at temperatures varying from 8 to 37° to one-tenth the original value. Storage at 37° for 19 weeks practically destroyed the potency of the juice.

It is estimated that 50 gal. of the concentrated juice would probably contain sufficient vitamin C to supplement the supply available in the tropical war diet of 1,200 men for 3 months, and that about £4,000 per year would be saved by substituting the concentrated orange juice for the lime juice now issued.

A histological study of sterility in the albino rat due to a dietary deficiency, K. E. Mason (*Natl. Acad. Sci. Proc., 11 (1925), No. 7, pp. 377–382*).—In this investigation of the testicular changes in rats on a diet lacking vitamin E (casein 18, starch 54, lard 15, butterfat 9, and salt mixture 4 per cent and yeast tablets 0.4 gm. daily), one testis was removed before or after maintenance for definite periods of time on the basal ration and the other some time later, both being examined histologically.

Different animals placed at weaning on the basal diet and maintained on it for similar periods of time showed rather wide differences in the condition of the testicles, but in all cases degeneration began between 50 and 60 days after weaning and was practically complete in 100 days. In rats kept on the deficient diet until testicular degeneration had begun and then placed on a stock diet of dog biscuits and carrots for periods up to 75 days no improvement in the histological condition of the other testis took place, but in others continued for 150 days on the basal diet supplemented by 40 gm. of fresh lettuce daily there was evidence of partial improvement. The same amount of lettuce fed from the beginning of the experiment completely prevented the testicular changes. A detailed description is given of the histology of the testicular degeneration in 5 successive stages.

Studies on the thermal death time of spores of Clostridium botulinum.—IV, The resistance of spores to heat and the dormancy or delayed germination of spores which have been subjected to heat, E. C. Dickson, G. S.

BURKE, D. BECK, and J. JOHNSTON (*Jour. Infect. Diseases, 36 (1925), No. 5, pp. 472–483, figs. 2*).—This continuation of the series of studies noted previously (E. S. R., 51, p. 168) extends the observations noted from a preliminary report (E. S. R., 48, p. 164) on the viability of spores of *C. botulinum* heated and incubated in various media, the majority of the final tests being in 1 per cent glucose peptic digest broth sealed with a thin layer of mineral oil as previously described (E. S. R., 46, p. 763). The tubes were examined over a period ranging from 28 to 39 months.

The conclusions drawn in the earlier report were in general confirmed. The only changes in maximal survival times were an increase of 45 minutes for spores heated in oil-stratified broth at 100° C., of 5 minutes in brain medium at 107°, of 1 minute in brain medium at 121°, and of 15 minutes in broth without oil at 100°.

The most important observation is considered to be the marked increase in heat resistance afforded by the thin layer of oil. The possibility of vegetable and animal oils acting in the same way is thought to suggest the advisability in canning operations of considering carefully the processing time of all foods in which these oils may exist or from which they may be liberated.

TEXTILES AND CLOTHING

First report of the fabrics co-ordinating research committee, A. W. CROSSLEY ET AL. (*London: [Gt. Brit.] Dept. Sci. and Indus. Research, 1925, pp. IV+70, pl. 1, figs. 5*).—This is a report of the activities of the committee composed of representatives of the admiralty, war, and air services and of the research association for the cotton, linen, rubber, and woolen industries and concerned with coordination in British textile research. Brief accounts of investigation on deterioration of fabrics by light and by microorganisms, the mechanical testing and the fireproofing of fabrics, and on specially treated linen and cotton duck exposed under different climatic conditions are appended.

Annual wool review, 1925, J. B. MCPHERSON (*Bul. Natl. Assoc. Wool Manfrs., 61 (1926), Extra No. 1, pp. 101–243, pls. 2, figs. 2*).—The status of the production, commercial movement, and manufacture of wool in the United States and elsewhere during 1925 is reviewed as in earlier reports (E. S. R., 53, p. 667), with the usual statistical information.

Broad-silk manufacture and the tariff, O. B. RYDER ET AL. (*Washington: U. S. Tariff Comn., 1925, pp. XVI+461, figs. 8*).—In this report of an intensive investigation of broad silk manufacture and of the tariff problems involved, the growth of broad silk manufacture in the United States is traced and the domestic industry at the present time is analyzed and described, with special reference to materials, processes, labor conditions, organization, and location. The types and grades of cloths produced in the United States are indicated, and the limitations on the variety of domestic products are explained. Similar information is given for foreign countries, and in addition their imports and exports of broad silks are discussed. Domestic imports and exports and their competitive significance, and wages, costs, and prices are also dealt with, and so far as possible, conditions in the United States and foreign countries are compared. The final chapter traces the history of the tariff on broad silks, discussing the effects of tariff changes and the advantages and disadvantages of various forms of duty.

The action of micro-organisms on silk, T. F. HEYES (*Abs. in Jour. Soc. Chem. Indus., 45 (1926), No. 13, p. 218*).—Various aspergilli grew readily on tin-weighted silk fabric but did not damage it. Several common bacilli were found to tender spun silk yarn on incubation at 37.5° C. (99.5° F.) for several

months. Silk hosiery fabric was tendered slightly in the cold by *Bacillus mycoides* and possibly *B. proteus*. Molds of various kinds were found to grow readily on this fabric without tendering it. No microorganism was found to discolor silk permanently.

A study of some micro-organisms causing rotting and discoloration in fabric, H. S. Holden and H. H. Barber (*Abs. in Jour. Soc. Chem. Indus., 45 (1926), No. 13, p. 218*).—Raw materials and water used by the textile manufacturer and the air of his mills are all inevitably contaminated with micro-organisms potentially injurious to his products. The bacteria found on wool are mostly common soil types which occur naturally on the living fleece as spores, which under alkaline conditions germinate and cause discoloration of the wool and pronounced tendering. The spores are very resistant to germicides. Three common pigment-producing bacteria have also been found to stain wool, viz, *Bacillus prodigiosus*, *B. violaceus*, and *B. pyocyaneus*. Acidification of the wool tends to inhibit the growth of bacteria but encourages the growth of yeasts and molds. The molds produce discoloration and tendering but act more slowly than bacteria, while yeasts produce discoloration only. With starch-dressed cotton goods the frequently acid starch used provides a suitable food material for yeasts and molds, many of which give rise to widespread discoloration.

Washroom agencies, G. H. Johnson (*Starchroom Laundry Jour., 33 (1926), No. 5, pp. 186, 188, 190, 192*).—In a discussion of the action of water, alkalies, hypochlorite solutions, and acids on textile fibers and fabrics, it is concluded that as far as the washing process is concerned tears and holes are more likely to occur in wool, silk, or rayon pieces while they are in a wet condition, whereas cotton and linen are stronger wet than they are dry. Of the supplies used in the power laundry the two likely to diminish tensile strength are bleach, if applied carelessly, and oxalic acid, if improperly rinsed from the loads previous to drying.

MISCELLANEOUS

Work of the Huntley Field Station in 1923 and 1924, D. Hansen et al. (*U. S. Dept. Agr., Dept. Circ. 369 (1926), pp. 43, figs. 9*).—The experimental work reported, carried on at Huntley, Mont., is for the most part abstracted elsewhere in this issue.

Report of the Guam Agricultural Experiment Station, 1924, C. W. Edwards et al. (*Guam Sta. Rpt. 1924, pp. 14, figs. 7*).—This contains reports of the director and the assistants in agronomy and horticulture and in poultry husbandry, and meteorological observations. The experimental work recorded is for the most part abstracted elsewhere in this issue.

Thirty-eighth Annual Report [of Georgia Station], 1925, H. P. Stuckey (*Georgia Sta. Rpt. 1925, pp. 91–115, figs. 4*).—This contains the organization list, a report by the director of the station on its work during the year, and a financial statement for the fiscal year ended June 30, 1925. The experimental work reported is for the most part abstracted elsewhere in this issue.

Report of Southeast Demonstration Farm and Experiment Station, Waseca, 1913–1918, A. Boss (*Minnesota Sta., Waseca Substa. Rpt. 1913–1918, pp. 20, figs. 5*).—The history and development of this substation is briefly reviewed, with a financial statement for each of the fiscal years for the 6-year period ended June 30, 1918.

Forty-fourth Annual Report of [Ohio Station], 1925, C. G. Williams (*Ohio Sta. Bul. 392 (1926), pp. 100, figs. 17*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1925, and a report

of the director summarizing the work of the station during the year. The experimental work reported not previously noted is for the most part abstracted elsewhere in this issue.

Twenty-seventh Annual Report [of Washington College Station], 1917 (*Washington Col. Sta. Bul. 152 (1918), pp. 8*).—This contains the organization list, a report of the work of the station, and a financial statement for the Federal funds for the fiscal year ended June 30, 1917, and for the State funds for the fiscal year ended March 31, 1917.

Canning crops investigations, R. W. THATCHER (*New York State Sta. Circ. 86 (1926), pp. 6*).—Lists are given of new projects organized and in progress in canning crops investigations under a special State appropriation and of general projects under way which have more or less bearing on the production of canning crops in New York.

Abstracts of Bulletins 305 to 327, inclusive, A. D. JACKSON (*Texas Sta. Bul. 338 (1926), pp. 12*).—Abstracts are given of publications previously noted.

[Recent bulletins of the Vermont Station] (*Vermont Sta. Circ. 13 (1926, p. 1)*).—Brief notes are given on Bulletins 244–253, all of which have been previously abstracted.

NOTES

Purdue University.—According to a note in *Breeders' Gazette*, the departments of soils and crops in the station and the department of agronomy in the school of agriculture have been consolidated into a department of agronomy, headed by A. T. Wiancko. G. H. Cutler, formerly head of the department of agronomy of the University of Alberta, has been appointed professor of agronomy and assistant chief of the department.

Louisiana University and Stations.—A special State appropriation of $25,000 per annum for 1926 and 1927 has been granted to the stations for special investigations in sugar cane problems.

C. L. Osterberger, formerly of the instruction staff, has been transferred to the station to carry on experiments in farm machinery, particularly haymaking devices. Dr. H. B. Brown has been appointed cotton specialist and will conduct cotton breeding work in northwest Louisiana and at Baton Rouge.

National Institute of Poultry Husbandry of Great Britain.—A recent article in *New Jersey Agriculture* describes the work of this institute in considerable detail. The article is contributed by W. C. Thompson, poultry husbandman of Rutgers University and the New Jersey Stations, who has been on leave of absence for nearly two years to serve as the first director of the institute and who is to return to his former duties about October 1.

The work of the institute, established in 1924 on the farm of the Harper Adams Agricultural College with the college flock and existing buildings as a nucleus, is described as now well under way. The institute has been developed substantially as an experiment station for the smaller farm animals, and is organized into departments of poultry husbandry, waterfowl, rabbits, pigeons, and milking goats.

The largest department is that of poultry husbandry, for which an area of nearly 20 acres is available and which it is planned to carry on with about 1,800 adult fowls each year. Representative flocks of White Leghorns, White Wyandottes, Rhode Island Reds, Light Sussex, and Black Leghorns are being maintained, with smaller numbers of about a dozen other breeds for educational purposes. The building eqnipment of the experimental poultry plant includes a 100-ft. multiple-unit brooder house, with an average capacity of 2,500 baby chicks, 2 laying houses each 124 by 14 ft., 1 two-section multiple-unit laying house, a farm poultry house, a cockerel house, a typical commercial ready-made poultry house, 12 colony year-round houses, 14 double-pen special-mating breeding houses, and 8 movable houses on wheels, together with miscellaneous equipment. Special provision has been made for experimental work in comparisons of yard arrangement, feeds, and other points. During the past year 10 flocks of 40 White Leghorns each have been compared as to cost of egg production on five different rations.

The department of waterfowl culture is giving special attention to egg-laying ducks, which have become of considerable economic importance in Great Britain, and is also working with the heavier type of duck and with geese. About 4 acres of land and 3 small ponds are available for this department.

The department of rabbit culture is attracting much attention in view of the recent development of the commercial production of Angora and other rabbits for fur and wool. About 600 rabbits may be accommodated in the rabbitry. The department of pigeon culture has a capacity of about 75 breeding pairs and is confining its efforts for the present to squab production and table pigeons.

The department of goat breeding includes a herd of three milking breeds presented to the institute by a goat breeder of Dorsetshire. Much of the milk is being used with great success in the feeding of rabbits and baby chicks, and the combination is thought to be of considerable promise under many English conditions.

American Society of Agricultural Engineers.—This society held its twentieth annual meeting at Lake Tahoe, Calif., June 23–26.

The first day of the meeting was featured by a special conference of State leaders of rural electrification projects and numerous committee reports. A general program was also conducted, the main feature of which was the annual address of the president, F. A. Wirt. This address stressed the need of a strong organization to represent agricultural engineers and coordinate their activities in their relation to the general agricultural scheme. J. B. Davidson of the U. S. Department of Agriculture spoke on a national program of research in mechanical farm equipment, discussing in detail the progress being made by the research survey in this field. It was pointed out that a total of 110 projects relating to mechanical farm equipment have been reported, and that the number has increased rapidly during the past two years. J. D. Long of the California Station presented a paper on The Use of Earth in Building Construction, and R. B. Lourie discussed the manufacturer's place in a farm machinery research program.

During the evening of the first day the farm structures and rural electrification divisions of the society conducted separate sessions. The farm structures session was opened by a paper on Farmhouse Arrangement from the Standpoint of Household Management Research, by G. Gray of the Nebraska Station. M. E. Cook discussed the progressive construction of farm homes, with special reference to buildings on the California State land colonies, and A. W. Turner of the Iowa Station presented a plan for the reduction of plumbing costs in the farm home. W. G. Kaiser presented the results of recent investigations in the farm storage of potatoes, apples, and similar crops, and J. L. Strahan discussed factors in the automatic control of natural draft ventilation.

The rural electrification session was opened by F. J. Zink of the Iowa Station who presented a paper on Rural Line Characteristics—Improving Load and Diversity Factors. E. A. Stewart of the Minnesota Station presented the results of studies of poultry conditions on the farm as affected by electricity, and G. W. Kable of the Oregon Station discussed recent developments in stationary orchard spraying installations. The session was closed by a report by B. D. Moses of the California Station of the results of investigations in the application of electricity to the dairy industry of California.

The program for the second day was opened by a paper on Rural Electrification from an Economic and Engineering Standpoint, by L. S. Wing. C. D. Kinsman of the U. S. Department of Agriculture presented the results of investigations on the relation of power to agricultural products and profits. A. Huntington presented a paper on The Farmer as a Manufacturer, in which the interdependence of engineering and economics in the development of the agricultural industry was stressed. The session was closed by a soil dynamics conference, conducted by R. W. Trullinger of the U. S. Department of Agriculture.

The program for the third day was opened by a paper on Irrigation in Relation to Soil Moisture and Plant Growth, by F. J. Veihmeyer of the California Station, which reported the results of experiments that have contradicted much of the generally accepted knowledge on the subject. J. V. Mendenhall discussed the requirements of an agricultural engineer, and E. Mead, Commissioner of Reclamation, U. S. Department of the Interior, presented a paper on A National Reclamation Policy. R. W. Trullinger presented a critical analysis of some of the outstanding research work in agricultural engineering during the year, and stressed the need for more thorough treatment of some of the subjects, especially soil hydraulics and dynamics. A symposium on The Engineer and the Soil—An Orientation for Reclamation, led by O. V. P. Stout of the U. S. Department of Agriculture, opened the land reclamation division program. This was followed by a paper presenting the results of investigations of the flow of water through pump strainers, by G. S. Knapp, and by a report of investigations on the effect of alkali on the strength and durability of concrete pipe, by D. G. Miller of the U. S. Department of Agriculture.

The farm machinery division program was opened by a report of investigations of machinery for corn borer control, by C. O. Reed of the Ohio Station. Reports were given by E. J. Stirniman of the California Station on the results of investigations on the handling of grain by the bulk and sack methods, and by G. W. Kable on the results of research in feed grinding. The session was closed by a paper on The Adaptation of Farm Machines to Extreme Hillside Conditions, by C. C. Johnson of the Washington Station.

The fourth day was featured by a conference of consulting agricultural engineers for the purpose of organizing as a group, and a college division program. This program was opened by a seminar on teaching methods, conducted by C. O. Reed. M. L. Nichols of the Alabama Station presented a paper on How Research Projects Can Be Improved, which was discussed at length by Director E. D. Merrill of the California Station and by R. W. Trullinger. E. W. Lehmann of the Illinois Station discussed the teaching of farm mechanics in high schools. That portion of the college division program relating to extension activities included a paper by R. L. Patty of the South Dakota State College of Agriculture on Preparing a State Program in Agricultural Engineering Extension Work, and a paper by I. D. Wood of the University of Nebraska on Methods of Measuring Results in Agricultural Engineering Extension.

Officers for the ensuing year were elected as follows: President, O. W. Sjogren of the Nebraska Station; first vice president, T. Brown; second vice president, J. L. Strahan; and member of executive council, M. L. Nichols.

New Journals.—*Berichte über die Wissenschaftliche Biologie* is being issued biweekly as Section A of *Berichte über die Gesamte Biologie*. The initial number contains about 260 abstracts, classified into 10 sections.

Horizons is a quarterly publication of landscape architecture, being issued at the Iowa State College as the official organ of the Mississippi Valley Chapter of the American Society of Landscape Architects, Inc.

Boletín de Informes del Instituto de Bacteriología de la Escuela de Veterinaria, Montevideo, is being published monthly. The initial number deals largely with plans for the reorganization of the institute and its future program.

Medicina Veterinaria is being issued monthly by the alumni of the National School of Veterinary Medicine of Mexico. The initial number contains several original articles by members of the faculty, abstracts, notes, etc.

EXPERIMENT STATION RECORD

VOL. 55 AUGUST ABSTRACT NUMBER No. 3

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Biochemistry of man and of animals since 1914, F. HAUROWITZ (*Biochemie des Menschen und der Tiere seit 1914. Dresden: Theodor Steinkopff, 1925, pp. XII+148, figs. 4*).—Biochemical literature from 1914 to 1924, inclusive, is reviewed briefly under two main sections, general and special biochemistry.

Agricultural biochemistry and the food problem, R. A. GORTNER (*Mid-Pacific Mag., 30 (1925), No. 1, pp. 33–44, figs. 5*).—This paper, which was prepared for the Pan-Pacific Food Conservation Conference, consists of a general discussion of various agricultural problems in the solution of which chemistry has played an important part. Among these may be cited the beet and cane sugar industries, the utilization of arid and semiarid land for both plant and animal production, the development of crops capable of being directly utilized as food by man, and the place of leafy plant tissues in human and animal nutrition. In conclusion the qualifications of the agricultural chemist are discussed briefly.

Laboratory manual of elementary colloid chemistry, E. HATSCHEK (*London: J. & A. Churchill, 1925, 2. ed., pp. IX+11–153, figs. 21*).—A revision of the manual previously noted (E. S. R., 45, p. 108).

The practical methods of organic chemistry, L. GATTERMANN, rev. by H. WIELAND (*Die Praxis des Organischen Chemikers. Berlin: Walter de Gruyter & Co., 1925, 19. ed., rev., pp. XII+379, figs. 52*).—This is the nineteenth edition of this well-known laboratory manual of organic chemistry, the translation of an earlier edition of which has been previously noted (E. S. R., 32, p. 109).

Optical measurements for the chemist and physician, F. LÖWE (*Optische Messungen des Chemikers und des Mediziners. Dresden: Theodor Steinkopff, 1925, pp. XI+166, figs. 34*).—This literature review deals with recent developments in spectroscopy, refractometry, and quantitative interferometric measurements.

Biochemistry of the fats, W. R. BLOOR (*Chem. Rev., 2 (1925), No. 2, pp. 243–300*).—In this review the term "lipides," as adopted by the International Union of Pure and Applied Chemistry, has been used to designate the fats and other compounds of the fatty acids associated with them in life processes. The group characteristics are given as insolubility in water and solubility in the fat solvents such as ether, chloroform, and benzene; relationship to the fatty acids as esters, either actual or potential; and utilization by living organisms. Included in the classification are the simple lipides, or esters of the fatty acids with various alcohols, as represented by the fats and waxes; compound lipides, or esters of the fatty acids containing other groups in addition to an alcohol and fatty acid, including the phospholipides, glycolipides, aminolipides, sulfo-

lipides, etc.; and derived lipides, or substances derived from the above groups by hydrolysis, including the fatty acids of various series and the sterols. The members of the various groups are discussed from the standpoint of their chemical nature and their behavior in the animal organism. The review closes with brief sections on fats in the diet and vitamins associated with fats.

A bibliography of 205 titles is appended.

Studies upon starch, C. L. ALSBERG (*Indus. and Engin. Chem., 18 (1926), No. 2, pp. 190–193*).—"Evidence is presented in support of the view of Harrison and others that starch heated in water suspension does not, for most species, disintegrate to form a colloidal solution. The starch granules merely swell. The process is a gradual one; the 'gelatinization point' can not be regarded as a characteristic constant of a starch variety. Most boiled starches are suspensions. Their viscosity is that of a suspension rather than that of a true colloidal solution. Anything which disintegrates the granules greatly lowers the viscosity of boiled starch.

"If natural, untreated starch is ground in a pebble mill until most of the granules, while still recognizable under the microscope as starch, are injured, the starch becomes incapable of yielding paste in ordinary concentration. A large part of the starch granule substance becomes colloidally soluble in cold water. From such ground starch, without heat or the use of any reagent, clear solutions can be obtained in cold water, containing material which gives the characteristic iodine reaction, does not reduce Fehling's solution, and dialyzes through thin collodion membrane. This material is still under investigation. From the observations upon ground starch, it follows that the physical properties of boiled starch can not depend solely upon the colloidal properties of any of its constituents, such as amylopectin."

Chemical investigations of fruits and their products, I, II, F. TUTIN (*Biochem. Jour., 19 (1925), No. 3, pp. 416–419*).—Two papers are presented.

I. *Apple juice as a source of sorbitol.*—The following method is described for the isolation of sorbitol from apple juice: To fresh apple juice concentrated under diminished pressure to about one-third of its volume a slight excess of basic lead acetate solution is added. After the removal of the precipitate by filtration and the excess lead in the filtrate by hydrogen sulfide and filtration, the filtrate is fermented with yeast in an incubator and concentrated under diminished pressure. The treatment is repeated, after which the gumlike residue finally obtained is acetylated on a water bath and the hexa-acetylsorbitol resulting is extracted with ether and purified by crystallization from ethyl acetate. The sorbitol is set free by boiling the crystals under a reflux condenser with 2 per cent aqueous sulfuric acid, removing the excess sulfuric acid with barium hydroxide, filtering to dryness under diminished pressure, and recrystallizing from alcohol.

II. *The fate of sugar during "cider sickness."*—This paper describes an application of the method noted above to the determination of the nonreducing substances present in cider which has undergone the second fermentation described by Barker and Hillier as cider sickness (E. S. R., 29, p. 208).

A small amount of hexa-acetylsorbitol was obtained, together with a very much larger amount of hexa-acetyl-*d*-mannitol. It is concluded that the second fermentation results in the reduction of a portion of the sugar present to mannitol.

Lignin.—I, The lignin of pine wood [trans. title], A. FRIEDRICH and J. DIWALD (*Monatsh. Chem., 46 (1925), No. 1–2, pp. 31–46*).—Fine pine wood sawdust from which the gums and resins had been removed by extraction with a mixture of benzol and alcohol, followed by 5 successive extractions with 5

per cent sodium hydroxide, was hydrolyzed for 48 hours at room temperature with dilute hydrochloric acid, heated under a reflux condenser for 8 or 10 hours with a large volume of 96 per cent alcohol, and filtered. On evaporating the filtrate to one-third its volume and adding a large volume of water, a primary lignin separated out as a brownish yellow amorphous precipitate. This was subjected to chemical analysis and found to have the empirical formula $C_{40}H_{48}O_{14}$. Of the oxygen atoms, three were identified as ether methoxyl, four as ester, and one as phenolic hydroxyl oxygen atoms. On the basis of reduction properties, polymerization phenomena, and color reactions, a carboxyl oxygen was assumed to be present, although this could not be proved definitely. Acetyl groups were not found. The residual oxygen atoms are for the present assumed to be bridge atoms. Attention is called to the similarity between this lignin and vanillin. The molecular weight is about five times that of vanillin, and the taste is similar to it.

Citric acid content of milk, F. F. Sherwood and B. W. Hammer (*Iowa Sta. Research Bul. 90 (1926), pp. 19–39*).—In an effort to determine whether or not milk varies in its citric acid content with the breed of the cow, the season, and the stage of lactation, milk samples from a total of 20 cows (5 Jerseys, 3 Guernseys, 7 Ayrshires, and 5 Holsteins) fed rations satisfactory for high milk production, including pasture in summer and silage in winter, were analyzed for citric acid. Determinations were also made of the acidity, ash, fat, and total solids. The samples were taken at various stages of lactation and throughout the seasons of the year.

The minimum, maximum, and average percentages of citric acid in the 335 samples analyzed were 0.07, 0.33, and 0.18 per cent. These variations did not appear to be correlated with the breed of the animal, the time of day of milking, stage of lactation, or the season. Determinations of the citric acid content of cream from two sources also showed no evidence of seasonal variation. The minimum, maximum, and average results for the other determinations were acidity 0.1, 0.25, and 0.17 per cent, ash 0.38, 1.1, and 0.7 per cent, fat 1.6, 9.2, and 4.58 per cent, and total solids 8.82, 20.15, and 13.52 per cent, respectively. The determined values for the total solids tended to run lower than the values calculated by adding to one-fourth the lactometer reading 1.2 times the fat value.

Some phosphorus compounds of milk.—I, The presence in milk of organic acid-soluble phosphorus compounds, H. D. Kay (*Biochem. Jour., 19 (1925), No. 3, pp. 433–446, fig. 1*).—Evidence is presented that at least two acid-soluble compounds containing phosphorus in organic combination are present in cow's, goat's, and human milk. One of these is readily hydrolyzable by extracts of various tissues and by dilute acids, and the other is much more stable. The former is estimated to be present to an average extent of 4.4 mg. of phosphorus per 100 cc. in cow's milk, 13.3 mg. in goat's milk, and 3.3 mg. in human milk. Both pass readily through a collodion dialyzing membrane which holds back protein but allows methylene blue to diffuse slowly. It is thought that the hydrolyzable ester, although not acted upon by pepsin or trypsin and only slowly by pancreatic juice, is probably broken down by the intestinal juice before absorption.

The fermentation of cellulose by thermophilic bacteria, J. A. Viljoen, E. B. Fred, and W. H. Peterson (*Jour. Agr. Sci. [England], 16 (1926), No. 1, pp. 1–17, figs. 2*).—The authors have isolated from fermenting manure by the use of a medium containing cellulose a thermophilic organism capable of destroying cellulose at 65° C. The organism is motile, Gram-negative, stains well with carbol fuchsin and poorly with methylene blue, and forms spores

which withstand heating at 115° for 35 minutes and germinate more readily after heating at 100° for 5 or 10 minutes.

In addition to cellulose, the organism ferments starch, raffinose, sucrose, maltose, lactose, mannose, galactose, fructose, glucose, xylose, and arabinose. The temperature range during which fermentation takes place is from 43 to 65°, the time required for completion of the fermentation decreasing with increase in temperature. In a 1 to 5 per cent suspension of cellulose, the amount destroyed during the fermentation varies from 70 to 95 per cent. Of this, 50 to 55 per cent is regained as acetic acid, 5 to 25 per cent as ethyl alcohol, and the rest as small amounts of butyric acid, carbon dioxide, hydrogen, and a fatty pigment soluble in ether. The fermentation, which begins from 12 to 18 hours after inoculation, is soon stopped by the accumulation of acid, which can be prevented by the addition of calcium carbonate to the medium.

The name *Clostridium thermocellum* is suggested for this organism.

Crystalline insulin, J. J. Abel (*Natl. Acad. Sci. Proc., 12 (1926), No. 2, pp. 132–136, figs. 2*).—Starting with the active insulin fraction described in a previous paper (E. S. R., 54, p. 409), the author has succeeded in obtaining a crystalline compound, chemically pure as denoted by a constant and definite melting point, which in doses as small as 0.01 mg. per kilogram lowers the blood sugar of rabbits to the convulsive level, 0.045 per cent. The method employed is essentially as follows:

About 1 gm. of the active fraction is dissolved in a slight excess of N/6 acetic acid, the solution is made up to about 60 cc. with water, and an acidulated solution of brucine containing 6 gm. in 95 cc. of N/6 acetic acid is added. This precipitates the contaminating substances, together with some insulin, and these are removed by centrifugalization. The clear centrifugalate is precipitated with N/6 pyridine and immediately centrifuged. The glistening highly refractive crystals obtained may be purified by solution in N/6 acetic acid and reprecipitation with pyridine, or better by solution in M/15 disodium hydrogen phosphate, followed by the addition of N/6 acetic acid drop by drop with vigorous shaking until a slight turbidity persists. On standing over night crystals form which are described as "being very uniform in character suggesting a high degree of purity, as doubly refracting and as belonging to the rhombohedral division of the hexagonal system." The crystals melt sharply at 233° C. with slight browning at 215°.

Chemically, a large fraction of the sulfur is in the labile state as previously noted. The compound gives positive biuret, Millon's, Pauly, and ninhydrin reactions. It is easily decomposed by dilute alkali.

The extreme smallness of the dose required to bring about convulsions in rabbits or lower the blood sugar to 0.045 per cent within 5 hours (from 1/125 to 1/100 of a mg. per kilogram) is thought to indicate that the substance is "a hormone which, in very high dilution, influences carbohydrate metabolism, acting as it were like a catalyst in a chemical reaction."

On the substance promoting the growth and fermentative activity of yeasts, K. Ando (*Tokyo Imp. Univ., Govt. Inst. Infect. Diseases Sci. Rpts., 3 (1924), pp. 17–28*).—A reinvestigation of the question as to whether the growth-promoting action for yeasts can be used as a measure of vitamin B is reported, with the conclusion that although substances containing vitamin B such as oryzanin, Tsukie's vitamin B preparation, and yeast extracts are the most effective among the many substances tested for their action on yeast, the growth-promoting substance in these preparations is different in its properties from vitamin B. It is not destroyed by heating at from 120 to 140° C. for

2 hours nor by the action of N/10 or N/5 alkali, and is not adsorbed by fuller's earth. It is concluded that the test is not a reliable one for vitamin B.

Inorganic quantitative analysis, H. A. FALES (*New York: Century Co., 1925, pp. XII+493, figs. 49*).—Throughout this text emphasis is placed on the application of the principles of physical chemistry to the theory of quantitative analysis. The subject is developed according to the fundamental principles involved, the order of treatment being precision, weighing, measurement of volumes, neutralization, solubility product, oxidation-reduction, and evolution and measurement of gases. Numerous references are given as footnotes, and at the end of each chapter practical examples are given illustrating the points covered. An appendix contains specific gravity tables, tables of units of measurement, and other useful data.

The simplified Kjeldahl micro method.—Procedure without distillation [trans. title], B. POHORECKA-LELESZ (*Bul. Soc. Chim. Biol., 7 (1925), No. 9, pp. 1038–1043*).—A further study is reported of the method suggested in a previous paper (E. S. R., 53, p. 10) for the iodometric determination of ammonia without distillation in the micro Kjeldahl method. The principle of the method involves two titrations with a standard solution of sodium hyposulfite—a blank titration of the amount of iodine liberated in the presence of potassium iodide in acid medium by a known volume of the reagent and the titration of the amount of iodide liberated under the same conditions by the hypobromite remaining after the decomposition of the ammonium salts. Determinations by the new method in the presence of various catalyzing reagents used to assist oxidation indicated that potassium oxalate should be used in preference to copper sulfate. Satisfactory agreement was obtained by the new and distillation methods in the determination of the nitrogen content of various organic substances.

The most rapid micro method for determining nitrogen [trans. title], A. KULTJUGIN and E. GUBAREFF (*Biochem. Ztschr., 164 (1925), No. 4–6, pp. 437–441*).—Attention is called to two sources of error leading to low results in the Acél micro method of determining nitrogen (E. S. R., 46, p. 615). These are incomplete ashing and decomposition and loss of ammonium sulfate on too prolonged ashing. By a simple modification of the method, involving the use of hydrogen peroxide as a catalyzer, both of these errors are said to be overcome and the time required for ashing reduced to a maximum of 15 seconds. The average error by the new method is ±4.3 per cent.

The estimation of phosphorus and magnesium, C. P. STEWART and W. ARCHIBALD (*Biochem. Jour., 19 (1925), No. 3, pp. 484–491*).—A micro volumetric method for the determination of phosphorus and magnesium in blood, urine, etc., is described, with data on its accuracy.

The method for phosphorus is an adaptation of the Pemberton method of precipitating the phosphorus as ammonium phosphomolybdate, dissolving the precipitate in standard NaOH, and titrating the excess alkali with standard acid (E. S. R., 5, p. 444). For determining magnesium in blood serum, the method of Kramer and Tisdall (E. S. R., 46, p. 203) is used for the separation of calcium and the precipitation of magnesium, and this precipitate is used for the phosphorus determination.

Rapid method for the determination of phosphates [trans. title], R. F. LE GUYON and R. M. MAY (*Bul. Soc. Chim. France, 4. ser., 37 (1925), No. 10, pp. 1291–1293*).—In the method described silver nitrate is used as the precipitating agent, but instead of the excess silver nitrate being determined as is the case in the usual methods involving this reagent, the amount actually

used in the precipitation is determined from its nitric acid solution by the Volhard method.

Use of the quinhydrone electrode for the determination of the pH of soils [trans. title], C. Brioux and J. Pien (*Compt. Rend. Acad. Sci.* [*Paris*], *181* (*1925*), *No. 3*, *pp. 141–143*).—Data are reported on the pH values as determined by the hydrogen electrode and the quinhydrone electrode on soil suspensions and centrifugalates of 37 soil samples of varied geological origin from the Department of Seine-Inférieure and from Brittany. For comparison the acidity values of the soil expressed as CaO per 100 are also reported.

The agreement between the values obtained by the hydrogen electrode and the quinhydrone electrode on soil suspensions was not as good as that reported by Christensen and Jensen for Danish soils (E. S. R., 51, p. 805). The highest values were obtained with plateau silt and flinty clay soil. Good agreement was secured, however, when the centrifugalates instead of suspensions of the soil were used. In two or three samples there was not satisfactory agreement, even with the centrifugalate.

In view of the simplicity and rapidity of the quinhydrone method it is urged that further tests of soils be made to establish the cause of the occasional anomalous results.

Determination of strength of liquid hydrocyanic acid by specific gravity, M. Walker and C. J. Marvin (*Indus. and Engin. Chem.*, *18* (*1926*), *No. 2*, *pp. 139–142*, *figs. 4*).—Specially designed apparatus for the gravimetric determination of liquid hydrocyanic acid and for the determination of its specific gravity and a portable apparatus for determining the specific gravity of liquid hydrocyanic acid in drums are described and illustrated, with the technique for their use. By means of the first two methods a table has been worked out giving percentages of hydrocyanic acid by specific gravities for temperatures varying by 1° from 0 to 25° C. and specific gravities by 0.001 differences from 0.682 to 0.750. By means of this table and the portable apparatus, it is said to be possible to determine the strength of samples of liquid hydrocyanic acid rapidly and with an error of not more than ±0.1 per cent.

Determination of hydrocyanic acid in gaseous mixtures, G. E. Seil (*Indus. and Engin. Chem.*, *18* (*1926*), *No. 2*, *pp. 142*, *143*, *fig. 1*).—The reactions involved in the method described consist (1) in the action between hydrocyanic acid and iodine in sodium bicarbonate solution to form cyanogen iodide and hydriodic acid, the latter being neutralized by the sodium bicarbonate, (2) the action of hydrochloric acid on the mixture of cyanogen iodide and hydriodic acid forming iodine, and (3) the titration of the iodine with standard sodium thiosulfate solution. The technique of the method is described, with a diagram of a special 500-cc. Tutwiler burette which is recommended for the determination. It is said that the method never gives low results, but that if the original titration is carried too far or if too much acid is added to the colorless solution when it is acidified the results will be high.

A quick method for the determination of ozone, H. B. McDonnell (*Indus. and Engin. Chem.*, *18* (*1926*), *No. 2*, *p. 135*).—The method, which is used for checking the operation of an ozonizer at the Maryland Experiment Station, consists in allowing the ozonized air to pass from a nozzle with an outlet 1.5 mm. in diameter through a glass tube dipping 2.5 cm. below the surface of 30 cc. of a 1 per cent potassium iodide solution containing starch and an amount of sodium thiosulfate solution equivalent to 5 cc. of a 0.01 per cent iodine solution, and noting with a stop watch the length of time before the blue color appears in the solution, this being inversely proportional to the

concentration of ozone. The method is said to be applicable to low concentrations where the amount of ozone used is not over 1 mg. For higher concentrations low results are obtained on account of the liberation of potassium hydroxide.

Apparatus for the graphic registration of oxygen consumption and carbon dioxide production [trans. title], H. Dethloff (*Klin. Wchnschr., 4 (1925), No. 51, pp. 2440, 2441, figs. 3*).—In the apparatus described, which is adapted for the continuous recording of oxygen consumption and carbon dioxide production, a closed circuit of oxygen-rich and CO_2-free air is driven with a velocity of 12 liters a minute by a motor through a system consisting of a cooler, a gas meter, a flask of soda lime, a second cooler, a second gas meter, and a spirometer which registers the volume changes in the system. The oxygen consumption of a subject breathing into the system is measured by this alteration in volume and the CO_2 output by the difference between the volumes of gas in the two gas meters.

The apparatus is illustrated, with examples of its use.

A spirometer method of studying continuously the gaseous metabolism of man during and after exercise, K. Furusawa (*Roy. Soc. [London], Proc., Ser. B, 99 (1926), No. B 695, pp. 148–154, figs. 6*).—The method described employs a large spirometer, the gases in which are kept constantly stirred by means of a small electric fan. Samples of the gases are removed from time to time for analysis, and the total ventilation is measured every 10 liters. The amounts of oxygen used and carbon dioxide expired by the subject during any time interval may be calculated from the analysis of the sample and the total volume of the expired gas. By increasing the number of samples taken it is possible to make a continuous curve of the percentage of oxygen in the total expired air up to any given time, the percentage of carbon dioxide in the total expired air, the total volume of oxygen used up to a given time, or the total carbon dioxide expired during the same interval.

Examples are given of the use of the apparatus in determining basal values and initial, recovery, and entire periods of exercise. The method is recommended as giving results similar to those obtained by other methods but involving considerably less labor.

Analysis of fats and waxes.—I, Methods, A. Grün (*Analyse der Fette und Wachse. I, Methoden. Berlin: Julius Springer, 1925, vol. 1, pp. XII+575, figs. 77*).—This reference work deals with the chemistry of the constituents of fats and waxes, general methods for their analysis, and special methods for the examination of technical fats and fat-containing materials. Among the substances discussed in this section are edible fats and oils, hardened fats, polymerized oils, oil-containing varnishes, lacquers, dyes, and cements, oxidized, vulcanized, and sulfonated oils, fat-containing ointments, technical fatty acids, candles, soaps, and glycerin.

The content of the most important proteins of food materials in tryptophan and a new method for the determination of tryptophan [trans. title], J. Tillmans and A. Alt (*Biochem. Ztschr., 164 (1925), No. 1–3, pp. 135–162, fig. 1*).—Various methods for the determination of tryptophane are reviewed critically, and a new method is proposed which differs from the Fürth and Lieben application of the Voisenet reaction (E. S. R., 45, p. 312) chiefly in that sulfuric acid is used in place of hydrochloric acid with formaldehyde, with the production of a wine yellow color.

The technique consists in pipetting into a beaker from 0.5 to 10 cc. of the protein solution according to concentration, adding 1 drop of 2 per cent formol and sufficient 66 per cent sulfuric acid to bring the protein into complete

solution, transferring to a 100-cc. Hehner cylinder, filling to the mark with sulfuric acid, and mixing thoroughly by pouring once or twice into the beaker. After 10 minutes the solution is matched against a standard solution of pure tryptophane. Data tabulated on the tryptophane content as determined by the new method of various food materials showed results lower in all cases than those reported by Fürth, Nobel, and Lieben (E. S. R., 45, p. 311), and more in accord with those of Folin and Looney (E. S. R., 47, p. 504) and May and Rose (E. S. R., 48, p. 312). The new method is recommended as more accurate than the first of these methods and less time consuming than the other two. Special points brought out in the discussion of the data are as follows:

As shown by others, the tryptophane content of human milk is much higher, 2.5 per cent, than that of cow's and goat's milk, 1.67 and 1.66 per cent, respectively. No alteration in the tryptophane content takes place in the ripening of cheese. The amounts of tryptophane in the myosin of horse and beef flesh do not vary enough to afford a means of distinguishing between the two. Wheat proteins contain more tryptophane than rye proteins, but the difference is not great enough for purposes of identification. The zein of corn meal contains no tryptophane.

Moisture determination in honey with an immersion refractometer [trans. title], W. MÜLLER (*Mitt. Lebensmtl. Untersuch. u. Hyg., Eidg. Gsndhts-amt.* [*Switz.*], *16* (*1925*), *No. 6, pp. 261–265*).—Data are reported on the moisture content of 30 samples of natural and 1 of artificial honey as determined by a gravimetric method and the refractometric method of Behre (E. S. R., 47, p. 808) and of some of the samples by a pycnometric method.

In general the second method gave lower results than the first but higher than the third. The agreement between the first two was sufficiently close to lead to the conclusion that the refractometric method is suitable for natural as well as artificial honeys. Its particular value is thought to be in the saving of time over the gravimetric method.

The use of true and imitation vanilla extracts in ice cream, H. B. PIERCE, W. B. COMBS, and W. F. BORST (*Jour. Dairy Sci., 7* (*1924*), *No. 6, pp. 585–590*).—In testing the relative flavoring powers and chemical differences between true and artificial vanilla at the Pennsylvania Experiment Station, 25 samples of vanilla were obtained from various sources, 10 of which were chosen for study. The extracts were tested when fresh and in ice cream at the various periods of storage. They were also examined to determine the specific gravity, total solids, and ash content by the Official method, and the alcohol content, lead number, and the presence of coumarin by the methods of Wichmann (E. S. R., 39, p. 505; 45, p. 718).

The results showed that judges were unable to differentiate between genuine and artificial extracts by taste either from the extracts themselves or after they had been added to ice cream, but the flavor of the artificial extracts did not persist as well in storage. In the chemical tests the values found for true and artificial vanilla overlapped except in case of the lead numbers. The genuine extracts varied in this respect from 0.56 to 0.996, while the imitation extracts varied from 0.226 to 0.412.

The chemical analysis of cotton, VIII, IX, L. V. LECOMBER and M. E. PROBERT (*Brit. Cotton Indus. Research Assoc., Shirley Inst. Mem., 4* (*1925*), *No. 8–9 pp. 107–120; also in Jour. Textile Inst., 16* (*1925*), *No. 11, pp. T338–T351*).—In continuation of this series of studies, some of which have been noted previously (E. S. R., 51, p. 715), two papers are presented.

VIII. *The waxes of cottons of different origin and their characteristics.*—Data obtained by methods outlined in the third paper of the series are reported

on the wax content (carbon tetrachloride extract) of samples of American, Egyptian, Sea Island, South American, and Indian cottons, taken at various stages of the preparing and spinning processes, and on the physical properties and chemical contents of these waxes. The mean values for the various samples are shown in the accompanying table.

Physical and chemical constants of cotton waxes

Cotton	Melting point (degrees C.)	Acid value	Saponification value	Unsaponifiable matter	Iodine value
				Per ct.	
American (12 samples)	75.5–80.5	25	66	64	22
Egyptian (7 samples)	76.5–80	27	78	54	23
Sea Island (2 samples)	78.5–79	21.5	61	61.5	23
South American (5 samples)	76.5–79	30	71	60	25
Australian (1 sample)	79.5	29	58	68	19
Mean of 27 samples other than Indian	75.5–80.5	26	70	61	23
Indian (6 samples)	68 –72	38	121	45	32

IX. *Identification of the fatty ingredients in sized goods.*—To identify the fatty ingredients added to cotton cloth during sizing, the authors suggest the analysis for fats and waxes as in the previous study of the sized and unsized materials, or, if samples of the unsized material are unavailable, a comparison of the data obtained on the sized material with the average values given in the above table. Characteristic data obtained with single and mixed softeners are presented and interpreted.

Processes of flour manufacture, P. A. Amos, rev. by J. Grant (*London and New York: Longmans, Green & Co., 1925, [3. ed.], rev., pp. XII+311, pls. 3, figs. 118*).—A revision of the volume previously noted (E. S. R., 45, p. 663).

The manufacture of root and cereal starches, J. Fritsch (*Fabrication de la Fécule et de l'Amidon. Paris: Amédée Legrand, 1925, 3. ed., rev. and enl., pp. VIII+422, figs. 90*).—This is a technical handbook on the manufacture of starch from potatoes, chestnuts, cassava, arrowroot, corn, rice, and wheat, and on analytical methods employed in connection with the manufacturing processes.

METEOROLOGY

The big tree as a climatic measure, E. Antevs (*Carnegie Inst. Wash. Pub. 352 (1925), pp. 115–153, pl. 1, figs. 7*).—A note on the author's abstract of this paper has been published (E. S. R., 53, p. 614).

Tree growth and climatic interpretations, E. Huntington (*Carnegie Inst. Wash. Pub. 352 (1925), pp. 155–182, figs. 3*).—A note on the author's abstract of this paper has been published (E. S. R., 53, p. 615).

Climate changes in western America (*Nature [London], 117 (1926), No. 2937, pp. 238, 239*).—This is a review of a series of papers on quaternary climates, published by the Carnegie Institution, including the two papers noted above.

Periodic return of rigorous winters and hot summers [trans. title], M. Cerchlet (*Rev. Vitic., 64 (1926), No. 1651, pp. 130–132*).—This is a review of an article by Gabriel, previously noted (E. S. R., 54, p. 807).

Investigations on the influence of weather on the phenology of the apple and winter rye [trans. title], E. Werth and K. and R. Mansfeld (*Mitt. Biol. Reichsanst. Land u. Forstw. No. 25 (1924), pp. 191–222, figs. 28*).—Charts

are given which show the time of blooming of apples and of blooming and harvest of rye in 1922 as compared with the average of previous years and as related to temperature, humidity of the air, sunshine, and other meteorological factors, with special reference to finding how far in advance these factors operate to control the final result.

A correlation between the time of beginning of blooming of apples and the temperature and other meteorological conditions of preceding months was observed, indicating that with more complete phenological and meteorological data covering a sufficient period of time it may be possible to predict for a restricted area the beginning of blooming two to three weeks in advance. The daily mean temperature of the preceding two or three months appears to determine the date of the beginning of blooming of rye. However, in this case also much more phenological and meteorological data are needed to confirm this conclusion. Humidity of the air in June and July appears to be a largely controlling factor with reference to the date of harvest of rye.

Climatic aspects of cotton growing in southern Illinois and Missouri, W. E. BARRON (*Abs. in Bul. Amer. Met. Soc., 7 (1926), No. 2, pp. 24, 25*).—Reference is made to the recent increase in the production of cotton in this region as compared with that of previous years. From a study of summer temperatures, average annual precipitation, and length of frostless season in the areas where cotton is grown in these States, the author concludes that "by using early varieties of cotton, and probably fertilizers, cotton growing may be profitably undertaken in suitable soils in Illinois and eastern Missouri as far north as St. Louis, or the line of 180 average frostless days, save on the plateau or in pockets rendered unfavorable by air drainage," and with greatly lessened injury by boll weevil.

A droughty year (1925) with bumper crops (in Ohio), W. H. ALEXANDER (*Bul. Amer. Met. Soc., 7 (1926), No. 1, pp. 14–16*).—This is an abstract of a paper presented at the 1925 meeting of the American Meteorological Society at Kansas City, Mo.

The large yields of corn and other crops in Ohio in the droughty season of 1925 apparently are not in accord with Smith's conclusion (E. S. R., 31, p. 229) that "the 10-day period from August 1 to 10 has the greatest influence upon the yield of corn in central Ohio" and that "the rainfall for the 10 days following the date of blossoming has an almost dominating effect upon the yield of corn, the larger the rainfall, the larger the yield." The rainfall during the critical period for corn in 1925 was far below even the normal amount, and there was no 10-day period during which the rainfall was sufficiently excessive to account for the large yield. The author is of the opinion that the result was not dependent upon the rainfall alone.

While the amount of rainfall of the year was small, its distribution was unusually favorable. A large percentage of the rain fell at night, making conditions more favorable for cultivation and efficient utilization of the moisture. Dry weather early in the season induced extensive root growth, which enabled the plant to make better use of the later rainfall when more favorable temperature conditions prevailed. The thermal constant was generally favorable throughout the growing season, and although the weather was cool during the blossoming period the deficiency of heat was compensated for by an abnormal amount of sunshine.

The author concludes that "the bumper crops in Ohio in 1925 were the result of an unusually fortuitous combination and distribution of the major climatic elements, such as rainfall, temperature, sunshine, winds, etc., to excellent cultivation, and to the complete absence of all climatic misfortunes."

Fire weather in the Adirondacks, G. S. LINDGREN (*Bul. Amer. Met. Soc., 7 (1926), No. 2, pp. 30, 31*).—Referring to a fire-weather service established in the Adirondack region in 1925 and a preliminary study of fire hazard conditions in that region, the author concludes that "fire-weather warnings, to be of practical value, should, if possible, include the following four elements: Precipitation, humidity in terms of decreasing or increasing dryness, strength and direction of winds, and last, but not least, the localization of forecasts." "While humidity is an important factor in connection with the inception of fires, an analysis of several of the larger ones indicates that wind velocity becomes equally important in connection with fire-spreading."

[Climatic conditions at Waseca, Minn., 1919–1923], R. E. HODGSON (*Minnesota Sta., Waseca Substa. Rpt. 1919–1923, pp. 5–7*).—Tables show (1) the highest and lowest monthly temperature for the five years 1919–1923, as well as the average temperature for each month and each year, and (2) the rain and melted snow by months and by seasons.

The annual rainfall varied from 20.02 in. in 1920 to 31.29 in. in 1919. The mean annual temperature varied from 43.9° F. in 1919 to 48.1° in 1921. The absolute maximum temperature, 101°, occurred in July, 1921; the absolute minimum, −28°, in February, 1923.

SOILS—FERTILIZERS

The science of soils and manures, J. A. MURRAY (*London: Constable & Co., 1925, 3. ed., rev. and enl., pp. XIV+298, pl. 1, figs. 44*).—This is the third edition of this book (E. S. R., 23, p. 319).

An automatic and continuous recording balance (the Odén-Keen balance), J. R. H. COUTTS, E. M. CROWTHER, B. A. KEEN, and S. ODÉN (*Roy. Soc. [London], Proc., Ser. A, 106 (1924), No. A 735, pp. 33–51, figs. 11*).—In a contribution from the Rothamsted Experimental Station an improved form of automatic self-recording balance is described, in which control is effected electromagnetically. The current passing through a solenoid is automatically adjusted, so that the force of attraction on a magnet suspended from one pan of an analytical balance is just sufficient to keep the balance in equilibrium. The adjustment of this current is effected by the movement of a sliding contact along slide wires, and this movement is in its turn controlled by the slight swing of the pointer attached to the balance beam as the latter moves from its equilibrium position. When the current, and hence the weight on the second pan of the balance, reaches a prearranged value, a subsidiary circuit is automatically closed and a small phosphor bronze ball of known weight is deposited on the pan above the magnet, the sliding contact is brought back to its initial position, and the cycle of operations recommences.

The arrangement of the circuits is such that the distance of the sliding contact from its zero position is to a close approximation linearly related to the current, and hence a recording ammeter is not needed, as a record on a rotating drum of the slider position is sufficient to give the required data. The records consist of a series of stepped curves, and a very open scale is obtained.

The apparatus can be used with no loss of sensitivity up to the maximum load the balance is designed to carry. The sensitivity also can be very simply adjusted, so that both rapid and slow changes of weight can be recorded. The apparatus can be employed with advantage in experiments involving a continuous measurement of increasing or decreasing weight, and its application to the study of sedimentation and flocculation of soil particles and the evaporation of water is illustrated.

***The indirect measurement of the aqueous vapour-pressure of capillary systems by the freezing-point depression of benzene*, E. M. Crowther and A. N. Puri** (*Roy. Soc. [London], Proc., Ser. A, 106 (1924), No. A737, pp. 232–242, figs. 2*).—Studies conducted by the Rothamsted Experimental Station on the validity of an indirect method for the measurement of aqueous vapor pressures, with particular reference to soils, are reported.

It was found that the freezing point of benzene is depressed by an amount which is strongly proportional to the aqueous vapor pressure of an insoluble material with which it is in equilibrium, provided surface energy is not one of the factors determining the vapor pressure of this material. The method was found to be both rapid and accurate when applied to substances such as mixtures of sulfuric acid and water and certain salt hydrates. The equilibrium is reached more slowly with capillary systems such as soil, and the apparent vapor pressures show a systematic deviation, which is the same for soils of widely different types.

On the assumption that a fraction of the water in such cases is held in micropores, and by making allowance for the effects of the changes in surface energy on the introduction of an additional liquid phase, it was found possible to account for this deviation. The agreement between the observed values and those calculated on this assumption is taken to afford evidence of the manner in which water is held in moist capillary systems.

Relation of biological processes to cation concentrations in soils, J. S. Burd (*Soil. Sci., 20 (1925), No. 4, pp. 269–283, figs. 4*).—Studies conducted at the University of California are reported on the relation between biological activity and the total concentration of the liquid phase of soils.

The data show how low the total concentration of the liquid phase of a typical mineralized soil remains unless the anions characteristic of biological oxidations are brought into play. It is considered quite clear that the nitrate, sulfate, and bicarbonate formed during such oxidations must largely determine the cation concentration of the soil solution, and may thus have important effects on plant growth quite apart from the physiological properties of the nitrogen or sulfur thus made accessible to the plant.

The data indicate further that when nitrate concentrations are high, the amount of this constituent is the most important element in determining cation concentration. Conversely, when nitrates are low, sulfates and bicarbonates exercise a predominating influence in this respect. It is concluded that if the nitrate concentration is high, as in the early part of the season, the usual decrease in this ion incidental to cropping is to a considerable degree compensated in its effect upon cation concentration by the other anions originating in biological processes or excreted by plant roots. It is also suggested that the large variation in nitrate content frequently observed in samples drawn within short distances of one another in the field may be without significance in terms of crop production.

In the light of the results obtained, changes in nitrate concentration are considered to be in general larger, both relatively and absolutely, than the concurrent changes in concentration of given cations in soils essentially homogeneous in the solid phase. Conclusions derived from observations of nitrate concentrations would not, therefore, appear to afford a secure basis for opinions as to the degree of variability of soils with respect to other constituents, nor for determining the number of soil samples necessary to establish the significance of other data.

The influence of the amount and nature of the replaceable base upon the heat of wetting of soils and soil colloids, W. W. Pate (*Soil Sci., 20 (1925),

No. 4, pp. 329–335).—Studies conducted at the Alabama Experiment Station on the influence of the nature of the replaceable base on the heat of wetting of soils are reported. Soils were saturated with different bases and the heat of wetting determined. Similar studies were made with colloid extracted from some of the soils.

In all cases the soil or colloid saturated with a monovalent base gave a lower heat of wetting than the soil or colloid saturated with a divalent base. The extracted colloid from different soils gave different heats of wetting and contained different amounts of total replaceable base. The colloid with a high replaceable base content gave a high heat of wetting, whereas the colloid with a low replaceable content gave a low heat of wetting. Apparently the amount of replaceable base is an important factor in determining the heat of wetting of soil colloids.

Dispersity and base exchange (ionic exchange) [trans. title], G. WIEGNER (*Kolloid Ztschr., 36 (1925), Ergänzb., Zsigmondy Festschr., pp. 341–369, figs. 5; abs. in Jour. Soc. Chem. Indus., 44 (1925), No. 26, pp. B464, B465*).—In a contribution from the Technical Academy of Zurich the general significance of base exchange in dispersoid chemistry is illustrated by reference to clay. The charge in clay particles is ascribed to the presence of a complex silicate anion holding by weak residual electrostatic forces a sheath of cations in dynamic equilibrium. The attractive force of these cations increases with increased valency and decreases with increased hydration. Ultramicrons with heavily hydrated cations, such as lithium and sodium, are bulky and viscous and resemble hydrophilic colloids. Those with less hydrate cations, such as caesium and calcium, are less viscous and resemble hydrophobic colloids. Simple effects of added electrolytes are obtained only if the added cation is the same as that in the outer sheath of the colloid particle. In other cases flocculation effects always include the effects of a base exchange.

An extensive series of experiments with clays containing a single alkali or alkaline-earth metal indicated that ultramicroscopic and viscosimetric measurements show that clays are more stable, more hydrated, more viscous, and less sensitive to electrolytes the greater the hydration of their cations. The less hydrated the cation of an added salt, the more rapidly does it flocculate a clay. Increasing the concentration of an added salt for dilute solutions and slow coagulation increases the size of the aggregates formed, as shown in increased viscosity. For equal concentrations of the added electrolyte, the least hydrated flocculating cation forms the largest aggregates and gives the highest viscosity. For more concentrated salt solutions the viscosity decreases with increasing salt concentration. The viscosity is higher for coagulated clays with heavily hydrated cations than for clays with less hydrated cations.

Owing to base exchange a small amount of potassium chloride added to a large amount of a calcium clay has the same flocculating effect as an equivalent amount of calcium chloride. The changes in the relative flocculating powers of uni- and bivalent ions with varied concentrations of chloride are considered to depend on changes in the amounts and relative importance of the exchanged bases.

The H-ion concentration of soils as affected by carbonic acid and the soil-water ratio, and the nature of soil acidity as revealed by these studies, W. H. PIERRE (*Soil Sci., 20 (1925), No. 4, pp. 285–305*).—Studies conducted at the University of Wisconsin on the effect of carbonic acid and the soil-water ratio on the H-ion concentration of soils are reported.

It was found that if during the electrometric determination of the H-ion concentration carbon dioxide was conducted into a soil suspension from the

bottom of the electrode vessel while the hydrogen was introduced only from the top, the carbon dioxide caused an increase in H-ion concentration. The displaced solutions from either acid or alkaline soils upon which plants were actively growing and giving off carbon dioxide were found to have the same H-ion concentration as corresponding uncropped soils.

The passage of carbon dioxide through the soil did not affect the H-ion concentration of the displaced soil solution. Similar treatment of a limed quartz sand greatly increased the H-ion concentration of the displaced solution. This was taken to indicate that soils are strongly buffered to carbon dioxide, and that the H-ion concentration of the actual soil solution is probably not affected to any important extent by the carbon dioxide given off by plant roots and decomposing organic matter. The H-ion concentrations of some soils were not affected by changing the soil-water ratio from the ratio 1:2 to 1:50.

Soils that showed a change in H-ion concentration with different soil-water ratios no longer showed such differences after soluble salts and the more soluble acids were washed out. After washing, the acidity of the soil was due entirely to the relatively insoluble acids. The data obtained on the effect of the soil-water ratio are thought to support the mineral acid theory of soil acidity.

A discussion is given of the methods of study used.

A critical pH for the formation of hardpan in acid clay soils, J. R. Skeen (*Soil Sci., 20 (1925), No. 4, pp. 307–311*).—Studies conducted at the University of Pennsylvania are reported which showed that hardpans observed in the field were present in acid clay soils having pH values ranging from 4.7 to 4.95. Precipitation experiments in the laboratory indicated that iron begins to precipitate at a pH of about 4.4, and that it is entirely precipitated at a pH of 5. It is concluded that there is a critical pH at which a hardpan may be found in an acid clay soil, and above which it can not be formed.

Remarks on the determination of soil acidity [trans. title], S. Ziobrowski (*Acta Soc. Bot. Polon., 3 (1925), No. 1, pp. 65–67*).—Studies are briefly reported which showed that filtration of fresh soil had the same effect on the H-ion concentration as the filtration of soils subjected to prolonged drying.

The mechanical analysis of soils, C. R. Harler (*Indian Tea Assoc., Sci. Dept. Quart. Jour., 1924, No. 2, pp. 99–110, pl. 1*).—Data on the conduct and interpretation of mechanical analysis, with particular reference to Indian tea soils, are presented.

Soil survey of the Lancaster area, California, E. J. Carpenter and S. W. Cosby (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1922, pp. IV+663–720, pls. 2, fig. 1, maps 2*).—This survey, made in cooperation with the California Experiment Station, deals with the soils of an area of 339,200 acres, situated mainly in the Mohave Desert region in southern California. The dominant physiographic feature of the area consists of a broad gently sloping plain, with occasional buttes protruding through the valley fill. Drainage is well developed, except in the central part of the valley, where alkali salts are present in various concentrations. The soils of the area have been weathered and accumulated under arid conditions, and their general features are characteristic of the soils of such regions. Lime is abundant, as a general thing, and is quite evenly distributed in the more recently deposited soils. With age and slow weathering, however, it has tended to accumulate in certain sections and in places has formed a lime-cemented hardpan.

Including rough broken and stony land, dunesand, and riverwash, 24 soil types of 13 series are mapped. The most extensive individual soil types are the Adelanto sand and rough broken and stony land. Irrigation is necessary

for the successful production of nearly all crops grown. Artesian water is available throughout the lower part of the valley, but is not used because of high alkali concentrations in the soils of the flowing-well area.

Soil survey of the Palo Verde area, California, A. E. KOCHER and F. O. YOUNGS (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1922, pp. IV+571–625, pls. 5, fig. 1, maps 2*).—This survey, made in cooperation with the California Experiment Station, deals with the soils of an area of 270,720 acres lying in the extreme southeastern part of California. The area is in two divisions, including the low recent alluvial Palo Verde Valley and the higher desert mesa. The elevation of most of the valley is lower than the river. The surface of the mesa is fairly level. The area lies in the southwest desert region, and the valley soils consist mainly of recent alluvial deposits. The desert soils consist of old valley filling deposits, most of which are maturely weathered and all of which are highly calcareous. All contain varying quantities of gravel, and for some distance out from the mountains the content of stones is sufficient to render them unfit for cultivation.

Including rough stony land, rough broken land, alluvial soils, riverwash, and dunesand, 24 soil types of 8 series are mapped, of which Superstition sand and rough stony land cover 23.4 and 10.7 per cent of the area, respectively.

Randolph County soils, R. S. SMITH, E. E. DETURK, F. C. BAUER, and L. H. SMITH (*Illinois Sta. Soil Rpt. 32 (1925), pp. [2]+64, pls. 3, figs. 6*).—This survey deals with the soils of an area of 379,590 acres in the southwestern part of Illinois. The topography varies from flat to undulating over much of the northern and eastern portions and from rough to hilly in a belt from 2 to 10 miles wide adjacent to the Mississippi River. Twenty-five per cent of the area is subject to serious erosion because of its rough topography. The drainage is almost entirely through Marys Creek and Kaskaskia River and their tributaries directly into the Mississippi River.

The soils are grouped as upland prairie, upland timber, terrace, residual, and swamp and bottom land soils. Thirty-six types are mapped, of which the yellow gray silt loam shallow loess and yellow silt loam deep loess upland timber soils cover 28.33 and 10.29 per cent of the area, respectively.

An appendix contains explanations for interpreting the soil survey and information on the principles of soil fertility. A supplement containing experimental field data of eight of the prevailing soil types is included.

Soil survey of Dorchester County, Maryland, J. M. SNYDER ET AL. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1922, pp. III+521–546, fig. 1, map 1*).—This survey, made in cooperation with the Maryland Geological Survey and Experiment Station, deals with the soils of an area of 368,640 acres lying in the Atlantic Coastal Plain in southeastern Maryland. The topography is prevailingly level, but varies from low and flat in the foreland country to gently undulating in the upland plain. Drainage is fairly well established in the upland country.

Two distinct groups of soils are found in the county, namely, the brown soils in the northern part and the gray or brownish gray in the southern part. The soils in the southern part have very poor drainage, and the lack of oxidation largely accounts for the gray color. The soils are either neutral or slightly acid. Including tidal marsh and meadow, 13 soil types of 5 series are mapped, of which the Elkton silt loam and tidal marsh cover 43.8 and 23.9 per cent of the area, respectively.

Soil survey of Kalamazoo County, Michigan, S. O. PERKINS and J. TYSON (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1922, pp. III+627–662, figs. 2, map 1*).—This survey, made in cooperation with the Michigan Experi-

ment Station, deals with the soils of an area of 359,680 acres lying in southwestern Michigan. The topographic and physiographic features of the area are typical of a glaciated region, ranging from rolling or hilly morainic belts to broad areas of level to gently undulating country. All the drainage ultimately reaches Lake Michigan. There are many swamps in the county and numerous lakes and ponds, but the uplands are generally well drained.

There are two groups of well-drained, normally developed upland soils in the county. Much the larger area consists of light-colored soils, ranging from light brown to brown. A smaller area consists of dark brown soils. Associated with the well-drained soils are numerous areas which have developed under conditions of imperfect to poor drainage. These soils are all somewhat dark in color, ranging from dark brown to black. The well-drained mineral soils of the county are acid in reaction to a depth of from 2 to 5 ft., and the dark brown soils developed under prairie conditions are strongly acid, while the dark gray to black mineral soils in poorly drained situations are alkaline or only slightly acid. The loamy sands and many of the sandy loams are said to be relatively deficient in nitrogen, phosporic acid, and potash. Including muck, 26 soil types of 13 series are mapped, of which the Fox loam, muck, and Bellefontaine sandy loam cover 16.5, 14.8, and 10 per cent of the area, respectively.

Soil survey of Manistee County, Michigan, L. C. WHEETING and S. G. BERGQUIST (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1922, pp. III+547–569, pls. 2, fig. 1, map 1*).—This survey, made in cooperation with the Michigan Experiment Station, deals with the soils of an area of 346,880 acres lying in the northwestern part of the Lower Peninsula of Michigan. The topography of the county is characterized by a number of separate hilly divisions or ridges and a number of associated plains and flat valley-like areas whose boundaries are fairly well defined. Every kind of glacial feature is developed within the area of the county, including moraines, glacial outwash plains, and old river terraces. With the exception of the valley of Bear Creek, the county is generally well drained.

Most of the soils of the county are sandy in texture, with the exception of a few areas of loam where the soil was developed from clay deposits. The soils belonged to two main groups, the brown eastern soils and the gray northern soils of the United States. Including muck, 13 soil types of 10 series are mapped, of which the Plainfield sand, Roselawn loamy sand, Rubicon loamy sand, and Roselawn sandy loam cover 27.5, 16.3, 13.4, and 10.7 per cent of the area, respectively.

Soil survey of Camden and Currituck Counties, North Carolina, S. O. PERKINS ET AL. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1923, pp. III+25–56, fig. 1, map 1*).—This survey, made in cooperation with the North Carolina Department of Agriculture and Experiment Station, deals with the soils of an area of 327,680 acres comprising two counties lying in the extreme northeastern part of North Carolina. The area is a low flat plain, slightly dissected, but with no perceptible general slope. About 85 per cent of the area is poorly drained.

The soils are grouped as light-colored mineral soils, dark-colored imperfectly drained soils with high organic content, and peat. The light-colored mineral soils constitute the largest area of agricultural soils. The soils range from slightly acid to strongly acid in character. Including peat, tidal marsh, peaty muck, swamp, and coastal beach, 24 soil types of 8 series are mapped, of which peat and tidal marsh cover 29.3 and 10.3 per cent of the area, respectively. The Elkton series is the most extensive of the classified soils.

Soil survey of Miami County, Ohio, E. R. ALLEN and O. GOSSARD (*Ohio Sta. Soil Survey Rpt. 1 (1924), pp. 5–90, figs. 15, map 1*).—This survey, made in cooperation with the U. S. D. A. Bureau of Soils, supplements the physical survey of the county made in 1912 (E. S. R., 34, p. 321). It is the first of a series which incorporates the results of laboratory and field studies, together with a description of the soils of the county. Suggestions based on the results of these tests are given for the management of these soils. An appendix contains information on soil survey methods.

Soil survey of Dickens County, Texas, W. T. CARTER ET AL. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1922, pp. III+479–520, pls. 4, figs. 2, map 1*).—This survey, made in cooperation with the Texas Experiment Station, deals with the soils of an area of 571,520 acres lying mostly within the Central Plains region in northwestern Texas. The surface is rolling prairie. Several small streams adequately drain all parts of the county. The soils have been derived from unconsolidated or very slightly consolidated clays, silts, and sands, all more or less calcareous. There are also some recent alluvial deposits. The fine sandy loams and clay loams are the most extensive and constitute nearly all the arable soils of the county. Including rough broken and stony land and riverwash, 26 soil types of 10 series are mapped, of which Miles fine sandy loam and rough broken and stony land cover 26.4 and 17.5 per cent of the area, respectively.

Properties and degeneration of the soils derived from brown earth types in southern Sweden [trans. title], K. LUNDBLAD (*Meddel. Statens Skogsförsöksanst. [Sweden], No. 21 (1924), pp. 1–48, figs. 7*).—A detailed chemical study of the brown soil and forest podsol in Swedish forests is reported. The brown soil prevails in the best beech forests and occurs to a certain extent in oak forests. The forest podsol prevails in mossy conifer forests.

In contrast to the podsol the brown soil has no leached stratum. The data on colloid content bring out the characteristic differences between the two soils. The brown soils show a uniform gel content in the upper strata which decreases very slowly. The podsol, on the other hand, shows a very low gel content in the Bleicherde stratum, a rapidly increasing gel content in the Orterde stratum, and a rapid decrease in gel content in the subsoil strata. The degenerated brown soils are more similar to the podsol in gel content.

The iron content is greatest in the upper strata of both soils where gel coagulation takes place. Alumina and silica, on the other hand, occur in greatest quantities in the lower strata. The Ortstein stratum apparently contains only very small quantities of inorganic gels.

Botanical development of moors with reference to the chemical composition of peat [trans. title], H. WARÉN (*Wiss. Veröffentl. Finnisch. Moorkulturver., No. 5 (1924), pp. 95*).—A large amount of data on the botanical development of some of the moors of Finland is reported, special reference being made to the influence of botanical origin of a moor on the chemical composition of the peat.

The mineralization of atmospheric nitrogen by biological means, A. BONAZZI (*Internatl. Soil Sci. Conf. [Rome], 4 (1924), Sect. III-B, No. 8, pp. 42, figs. 8*).—Studies conducted at the Ohio Experiment Station on nitrogen fixation by Azotobacter are reported. It is pointed out that *A. chroococcum* is a decidedly aerobic organism which competes actively for the oxygen placed at its disposal. It should therefore be capable of making possible the growth of anaerobic organisms with which it is growing. It is believed that the oxygen utilized by Azotobacter goes chiefly for processes of combustion of the energy material with the liberation of carbon dioxide. Under cultural conditions

pure *A. chroococcum* has been found capable of utilizing dextrine and salts of the lower aliphatic acids.

However, these sources of energy are not always utilized for purposes of nitrogen fixation, and investigations actually point to the possibility that Azotobacter only exceptionally acts as an immobilizer of the free molecular nitrogen of the air under natural conditions. From a strictly physiological standpoint this conclusion is emphasized by the extreme variability of the carbon-nitrogen ratio under rigid cultural conditions in pure or mixed cultures, not only in different strains of the same organism but in the same strain at different times and under different chemical, thermal, and physical conditions.

When the medium contains easily utilizable fixed nitrogen compounds, the energy material is used in a process of organization of these compounds, and the benefits to be derived from the life activities of this organism are negligible. It was found in addition that these latter processes, which often lead to considerable losses of nitrogen, can not always be active enough to compete with putrefactive changes and the losses of nitrogen by volatilization, so that even from this standpoint they have limited application.

"The final status of the question, then, is that *A. chroococcum* is a soil scavenger capable, when starved to it, of fixing small quantities of the free atmospheric molecular nitrogen, even though this property of the organism is seldom active to the extent of playing an important rôle in agriculture or geology. Besides, large quantities of the incorporated nitrogen are lost during the processes of decomposition necessary to make these cellular synthetes available to the higher plants. *A. chroococcum* is incapable of yielding soluble nitrogenous compounds as a result of this occasional nitrogen fixation activity, and these processes of decomposition are essential. However, living cells of this organism are highly resistant to decomposition, not only, but also to ingestion and digestion by protozoa."

Nitrogen recuperation in the soils of the Bombay Deccan, I, D. L. Sahasrabuddhe and J. A. Daji (*India Dept. Agr. Mem., Chem. Ser., 8 (1925), No. 5, pp. 53–68, figs. 2*).—Studies are reported which showed that when water is added to the soil, within 10 days a large quantity of nitrogen is fixed, and this continues to increase for about 35 days and then slowly decreases. The larger the quantity of water added up to 30 per cent the greater was the quantity of nitrogen fixed. Nitrogen fixation and nitrification were greater at 40° C. than at lower temperatures. An increase in nitrogen occurred both in the presence and in the absence of light.

The addition of lime to the soil already containing sufficient lime did not produce any advantage over the original soil with reference to nitrogen fixation, but it facilitated nitrification. If soil which had fixed the highest quantity of nitrogen after being moistened dried up and was then moistened again, the nitrogen increased further for four or five weeks more and then began to decrease. However, repeated drying did not increase the nitrogen content beyond a certain limit. If the soil was heated to 100° it lost a small quantity of nitrogen. This was soon made up if enough water was added, and the total amount of nitrogen fixed in the heated soil was higher than that in the unheated soil.

Denitrification as it depends on the reaction of the medium in relation to the liming of the soil [trans. title], T. M. Zakharova (*Trudy Nauch. Inst. Udobr.* (*Trans. Inst. Fert.* [*Moscow*]), *No. 29* (*1925*), *pp. 20*).—Studies are reported which showed that great numbers of denitrifying bacteria exist in certain Russian soils. Certain denitrifying bacteria were found to be most energetic at a reaction of from pH 7 to 8.2. Reactions more acid than pH 6.1

retarded and even stopped denitrification. The decomposition of both nitrites and nitrates was accelerated, however, if the soil became more alkaline than pH 6.1. A more alkaline reaction than pH 8.2 reduced denitrification, which ceased altogether when a reaction of from pH 9.6 to 9.8 was reached.

Soil cultivation as a factor in crop production, J. R. BOND (*Jour. Farmers' Club* [*London*], *1925, pt. 5, pp. 85–101*).—This paper summarizes a large amount of data on the influence of tillage on crop production, much of which is based on work which has been conducted at experiment stations in this country.

[Soil fertility experiments at the Colorado Station], A. KEZER and E. P. SANDSTEN (*Colorado Sta. Rpt. 1925, pp. 12, 13, 33, 34*).—It is reported that the use of the so-called duck-foot and the lister drill has made wheat growing possible where it was deemed impossible before. The duck-foot tills the land and leaves a cloddy surface. The lister drill spaces the drilled rows of grain twice as far apart as the ordinary drill and plants the seed in the bottom of a furrow which resembles a listed furrow.

Four years of experiments on the control of soil nitrates are reported to have shown that nitrates are relatively low in amount under a crop which covers the soil and is not tilled, and that nitrates are relatively high in amount under crops which are tilled and under fallow. The nitrate production is not the same in any two seasons, but when planted in a curve the curve has the same general trend for all of the four seasons.

Fertilizer experiments on vegetables are reported to have shown that in using fertilizers on a crop like tomatoes nitrogen should not be used to any large extent.

Fertilizer tests, R. E. HODGSON (*Minnesota Sta., Waseca Substa. Rpt. 1919–1923, pp. 21, 22*).—A comparison of plats treated with manure, acid phosphate, and raw rock phosphate, alone and in combination, with unfertilized plats indicated that if manure is not available acid phosphate will about take its place, but that acid phosphate is not needed on this soil if manure can be applied at the rate of 8 tons per acre once in 4 years.

The soils experiment fields of Missouri, F. L. DULEY and M. F. MILLER (*Missouri Sta. Bul. 238 (1926), pp. 60, figs. 40*).—A summary of the progress results obtained from the soil experiment fields is presented.

During the 19-year period of these experiments most of the soils have given good returns from phosphates and manure. Phosphates have given their most profitable results on wheat, clover, and alfalfa. Lime has been of value on certain soil types in growing clovers and alfalfa. Where lime has been combined with manure and acid phosphate, clover growing has been successful on practically all soils of the State. Potash has given slight increases on most of the fields, but it has been of sufficient importance to justify much attention to its use in only a few cases. Rock phosphate has given slight returns, but on the average has not been used profitably. Legumes planted in the corn for the purpose of supplying green manure have not justified the practice.

The results of individual fields are presented, and maps are included which show where the results of these experiments may be most directly applied.

[Soil fertility investigations at the North Carolina Station], C. B. WILLIAMS (*North Carolina Sta. Rpt. 1925, pp. 12–17*).—From pot experiments with millet it is concluded that sodium nitrate is the most efficient form of nitrogen, with other nitrates nearly equal. Manufactured tankages ranged widely in efficiency from a value nearly equal to that of sodium nitrate to one-third of that value. Low grade raw materials produced very little growth.

Pot experiments with muck soils showed that liming to complete neutrality did not produce a greater growth of corn than did moderate liming. The effi-

ciency of fertilizers was governed by the depth of liming. A greater benefit from sodium nitrate and potash was observed when the subsoil was limed than with an acid subsoil. Heavy liming and deep plowing were accompanied by injurious effects in the field. Liming had no relation to the injurious effect of acid phosphate. A marked similarity was observed in the acidity and chemical composition of soils from several of the muck lands in the flatwood areas of the Coastal Plain. This is taken to indicate a similarity in some of their characteristic responses to treatment.

The results of field experiments to determine the fertility requirements of different soil types and of fertilizer ratio and other experiments in cooperation with the U. S. D. A. Bureau of Plant Industry are also reported.

[Soil studies at the Rhode Island Station] (*Rhode Island Sta. Rpt. 1925, pp. 39–45, 47–49*).—Progress data on studies of organic matter for the soil, the efficiency of fertilizers and manures, the effect of crops on one another, and on the modification of sour soils being conducted at the station are presented (E. S. R., 54, p. 17).

Residual effects of forty years' continuous manurial treatments.—II, Effect of caustic lime on soil treated with barnyard manure, J. W. White and F. J. Holben (*Soil Sci., 20 (1925), No. 4, pp. 313–327*).—In a second contribution to the subject (E. S. R., 52, p. 323), the results of a study of two plats each receiving 120 tons per acre of barnyard manure during a period of 40 years, and one receiving in addition 20 tons per acre of burnt lime, are reported.

Soil treated with lime and manure produced during the period 13,120 lbs. of dry matter more than soil treated with manure without lime. Soil treated with lime and manure also contained more organic matter and nitrogen than soil treated with manure only. The application of lime to manured soil stimulated nitrogen fixation. Manure decomposed at an average annual rate of 5,428 lbs. per acre where lime was applied as compared with 5,071 lbs. where used alone. Soil treated with manure and lime contained less readily soluble humus than the unlimed manured soil.

Phosphate and manure experiment, R. E. Hodgson (*Minnesota Sta., Waseca Substa. Rpt. 1919, pp. 14–16*).—Results of a comparison of rock phosphate, acid phosphate, and manure and combinations thereof on 72 one-tenth or one-twentieth acre plats supporting a 4-year rotation of corn, wheat, oats, and clover are reported. In 1918 and 1919 both rock phosphate and acid phosphate, whether used alone or with manure, caused a marked improvement in clover. The manure also appeared to have some residual effect on the clover. Apparently contradictory results were obtained with corn with reference to phosphates, although manure apparently increased the yield.

Phosphoric acid and potash, H. R. Cooper (*Indian Tea Assoc., Sci. Dept. Quart. Jour., 1924, No. 4, pp. 227–238*).—Data on the use of phosphatic and potassic fertilizers on tea soils are reported and discussed. The data indicate that at present prices considerable saving can be effected by the use of ground mineral phosphates. These were found to vary in efficiency, the softer rocks being more easily soluble than the hard rocks. The finer the materials were ground the more efficient they were. The presence of iron and aluminum was found to be objectionable in phosphatic fertilizers. Potassium chloride was found to be much cheaper than any other source of potash and as efficient.

The action of nitrogen and phosphoric acid on Silesian soils in 1924 [trans. title], D. Meyer, K. Wodarz, and F. Meissner (*Ztschr. Pflanzenernähr. u. Düngung, 4 (1925), No. 11, Wirtschaft.-Prakt., pp. 479–502*).—The results of eight experiments with grains, four with potatoes, and five with beets to test

the action of different amounts of nitrogenous and phosphatic fertilizers are summarized.

Factors affecting returns in comparative experiments with sulphate of ammonia and nitrate of soda, E. W. HARVEY (*Amer. Fert., 63 (1925), No. 13, pp. 30–33, 54, 57, 58, 60*).—Studies conducted at the New Jersey Experiment Stations are reported, in which it was found that crop growth is profoundly influenced by the H-ion concentration of a soil, and that crops vary greatly in their preferences for H-ion concentration of a given soil. The efficiencies of ammonium sulfate and sodium nitrate were found to be greatly influenced by changes in the H-ion concentration of a soil. By adjusting the H-ion concentration of a soil with reference to the preferences of a given crop it was possible to show an apparent superiority of ammonium sulfate over sodium nitrate.

Soils which, through high metal content or other reason, readily give up to solution their iron, aluminum, zinc, or other metals proved toxic to a given plant at a lower H-ion concentration than did soils the metal content of which is lower or less easily brought into solution.

The conclusion is drawn that the H-ion concentration preferences of crops used should be considered in connection with each particular soil, and that the soil should be maintained within the optimum range of reaction for each plant during tests of the relative efficiency of nitrogenous fertilizers.

Calcium cyanamide and its use in Egyptian agriculture [trans. title], U. ZANNINOVICH (*Égypte Contemporaine, 16 (1925), No. 88, pp. 400–412*).—Data are presented on the use of calcium cyanamide as a fertilizer. This material yields available nitrogen gradually, and has a marked residual action. It is not easily leached and improves the physical condition and resistance to desiccation of the soil by virtue of its lime content. Cyanamide also acts as a soil insecticide and arrests denitrification in arable soils.

Manufacture of fertilizer urea on a tonnage basis, R. S. MCBRIDE (*Chem. and Metall. Engin., 32 (1925), No. 16, pp. 791–793, figs. 5*).—The process being used at the pilot plant at Niagara Falls is briefly described.

Solubilization of natural phosphates [trans. title], G. CALCAGNI (*Staz. Sper. Agr. Ital., 58 (1925), No. 1–6, pp. 146–160; abs. in Chem. Zentbl., 1925, II, No. 19, p. 1791*).—The author discusses the newer phosphatic fertilizers and their manufacture. On the basis of experimental results, he suggests that raw phosphates should be treated with nitric acid, acid potassium sulfate, or acid ammonium sulfate to make their phosphoric acid content more available. Such treatments were found to produce very valuable mixed fertilizers.

The determination of the solubility of phosphates in water or ammonium citrate solution was not found to correctly indicate their availability to crops. Solubility in disulfates is considered to be a better measure of availability.

Influence of fineness of different phosphorites on the utilization of their phosphoric acid content [trans. title], A. N. LEBEDÏANTSEV (LEBEDIANZEW), Z. V. SHCHEGLOVA (S. W. SCHTSCHEGLOWA), and S. A. REMIZOV (S. W. REMISOW) (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 2 (1925), No. 9, pp. 491–501*).—Experiments are reported which showed that sufficiently fine phosphorite meal had as good a fertilizing action as sodium phosphate. This was true for phosphorites from seven different Russian districts and for African rock phosphates. In order to produce such results it was necessary for the meal particles not to exceed 0.05 mm. in diameter. Certain other rock phosphates were found to require even finer grinding.

Influence of potassic fertilizers on the development and chemical composition of different cultivated plants [trans. title], E. GODLEWSKI (*Pam.*

Państ. Inst. Nauk. Gosp. Wiejsk. Pulawach (Mém. Inst. Natl. Polon. Écon. Rurale Pulawy), 3(1922), A, pp. 159–268).—Studies are reported which showed that plants which increase in yield on soils deficient in potash contain less potash and more of the other nutritive elements in their dry matter than do plants grown on soils rich in potash. This was found to apply more to the straw than to the grain of grain crops, and is taken to indicate that straw analyses should be used as a measure of potash availability of soils.

An abundance or deficiency of available potash in soils was found to have a more positive influence on the composition of the grain of oats and beans than on that of the grains of other cereals and legumes. A deficiency of available potash in the soil increased the content of other nutritive elements in the straw, especially lime and magnesia, but had no influence on the normal lime and magnesia contents of grain.

The variations in the chemical composition of the straw of different cereals were much less than those caused by the quantity of available potash in the soil. The contents of lime and magnesia of legume straw were double those of cereal straw. The dependence of the potash content of straw on the available soil potash was more marked for legumes than for cereals.

Potash deficiency in the soil was also found to influence the composition of the dry matter of root crops, there being an increase of other nutrients when potash was deficient. A notable exception to this rule was found in the case of potatoes, where the magnesia content decreased as the potash content of the soil decreased. The influence of an abundance of potash in the soil on crop yields was found to vary widely with the different crops. Crops cultivated year after year on the same soil reacted more strongly to potash fertilization than crops grown in rotation.

Different crops were found to assimilate different quantities of potash, root crops usually requiring more than cereals or legumes. The ability of different crops to assimilate potash from difficultly soluble minerals also varied, and they did not utilize the potash assimilated with the same economy in the production of dry matter. For a definite quantity of potash absorbed, root crops produced less organic matter than did legumes or cereals.

A deficiency of available potash in the soil resulted in a less economic utilization of the other nutrient elements by crops than where plenty of potash was present.

A French résumé is appended (pp. 262–268).

Potash in agriculture, F. T. Shutt (*Canada Dept. Agr. Pamphlet 61, n. ser. (1925), pp. 8*).—Information on practical sources of potash for agricultural use, such as commercial fertilizers, manure, wood ashes, and seaweed, is briefly presented.

Action of potassium iodide additions to sugar beets [trans. title], E. Ungerer (*Ztschr. Pflanzenernähr. u. Düngung, 4 (1925), No. 9, Wirtschaft.-Prakt., pp. 369–374*).—Experiments are reported which showed that fertilization with potassium iodide decreased the root size and sugar content.

Investigations on the effect of carbonate of lime on soil reaction [trans. title], S. T. Jensen (*Tidsskr. Planteavl, 31 (1925), No. 5, pp. 744–778, figs. 9*).—Investigations of 115 Danish field soils showed that the quantities of lime required by acid field soils in order to produce a pH of 7 varied greatly. Although the quantities required increased with diminishing pH values, they varied so greatly within the same reaction limits that a single reaction determination was inadequate for computing the quantities of lime required. Sandy soils seemed on the whole to require larger quantities of lime than loamy soils to produce the same change in reaction. It is noted that this finding seems op-

posed to the results of practical experience. This is apparently taken to indicate, therefore, that reaction is only one of the factors concerned in the lime requirement of soils, although perhaps one of the most important. Loamy soils required on an average more lime than sandy soils for the neutralization of exchange acidity as determined by the potassium chloride method.

Liming the soil, P. L. HIBBARD (*California Sta. Circ. 305 (1926), pp. 15*).—Practical information on the liming of California soils is presented.

More lime needed for New Jersey farms, A. W. BLAIR (*New Jersey Stas. Bul. 430 (1926), pp. 23, figs. 19*).—Practical information on the use of lime on New Jersey soils is presented.

Analyses of two pond silts [trans. title], Z. STARZYŃSKI (*Pam. Państ. Inst. Nauk. Gosp. Wiejsk. Pulawach (Mém. Inst. Natl. Polon. Écon. Rurale Pulawy), 3 (1922), A, pp. 321–327*).—Mechanical, chemical, and mineralogical analyses of pond muds from two localities in Poland are presented and discussed with reference to their fertilizer value.

Commercial fertilizers (*Md. Univ. Quart. No. 116 (1926), pp. 23*).—Guaranties and actual analyses of 351 samples of fertilizers and fertilizer materials collected for inspection in Maryland from July 1, 1925, to January 1, 1926, are reported.

Testing fertilizers for Missouri farmers, 1925, L. D. HAIGH (*Missouri Sta. Bul. 239 (1926), pp. 72, fig. 1*).—Guaranties and actual analyses of 558 samples of fertilizers and fertilizer materials collected for inspection in Missouri during the calendar year 1925 are presented, together with a list of brands registered and offered for sale in the State during the year.

Package fertilizer and the Missouri fertilizer law, F. B. MUMFORD and L. D. HAIGH (*Missouri Sta. Circ. 145 (1926), pp. 4*).—Information governing the sale of package fertilizer in Missouri is presented, together with a list of brands and guaranteed analyses of fertilizers registered and offered for sale in the State during 1925.

Analyses of commercial fertilizers and ground bone; analyses of agricultural lime, 1925, C. S. CATHCART ET AL. (*New Jersey Stas. Bul. 42 (1925), pp. 5–36*).—Supplementing Bulletin 422 (E. S. R., 55, p. 123), guaranties and actual analyses of 1,129 samples of fertilizers and fertilizer materials and actual analyses with guaranties of 11 samples of agricultural lime collected for inspection in New Jersey during 1925 are presented. A list of brands of fertilizer materials registered for sale in the State for the fiscal year ended October 31, 1925, is included.

Fertilizer registrations for 1926, C. S. CATHCART (*New Jersey Stas. Bul. 431 (1926), pp. 5–24*).—A list of brands of fertilizers registered for sale in New Jersey for the fiscal year ending October 31, 1926, is presented.

GENETICS

Evolution, genetics, and eugenics, H. H. NEWMAN (*Chicago: Univ. Chicago Press, 1925, 2. ed., [rev. and enl.], pp. XX+639, figs. 99*).—The book previously noted (E. S. R., 48, p. 564) has been revised and enlarged. New material dealing with the organized attack on evolution, with special reference to the Scopes trial, and papers by R. R. Gates and H. J. Muller on mutations have been added. The chapter on linkage and crossing over has been rewritten in a more elementary style, and a complete glossary of biological terms has been included.

Genetics [trans. title], (*Ann. Sci. Agron. Franç. et Étrang., 42 (1925), No. 5, pp. 357–365*).—Breeding work under the auspices of the Institute of Agronomic

Research in France during 1924 involved the production and improvement of wheat varieties resistant to disease, cold, and heat, and oats and barley varieties; the degeneration and improvement of potatoes; and miscellaneous studies with flax, colza, perfume plants, and ornamentals.

The fixation of avian chromosomes, R. T. HANCE (*Anat. Rec., 31 (1925), No. 2, pp. 87–92, figs. 4*).—The author describes methods employed at the University of Pennsylvania for the successful fixation of avian chromosomes.

On the attachment of non-homologous chromosomes at the reduction division in certain 25-chromosome Daturas, J. BELLING and A. F. BLAKESLEE (*Natl. Acad. Sci. Proc., 12 (1926), No. 1, pp. 7–11, figs. 4*).—This contribution from the Carnegie Institution supplements the information already recorded (E. S. R., 53, p. 227).

[Mutations in Datura] (*Carnegie Inst. Wash. Yearbook 24 (1924–25), pp. 22–24, 25, 26, fig. 1*).—Studies on mutations in Datura (E. S. R., 54, p. 628) were continued by A. F. Blakeslee, J. Belling, G. Morrison, and B. P. Watt.

Among trisomic types of Datura was found a weak-growing type, possibly the twelfth member of the $2n+1$ series of Daturas. New chromosomal mutants discovered were "dwarf," a secondary of "poinsettia," "smooth," a secondary of "glossy," and "scallop," a secondary of "reduced." A few new Mendelian characters were found in imported collections. Further information was obtained regarding the peculiarities and linkage relations of several mutants. The variation and geographical distribution of Daturas in certain South American countries are described, and continued studies on aberrant chromosome complexes in aberrant Daturas and other species are summarized. The effect of different types of developmental selection in the elimination of chromosomal mutations was investigated by J. Buchholz.

Inheritance in Crepis capillaris (L.) Wallr., III, J. L. COLLINS (*Calif. Univ. Pubs. Agr. Sci., 2 (1924), No. 9, pp 249–296, pls. 8*).—This paper is concerned with the description and mode of inheritance of a number of variations found in *C. capillaris.* Previous numbers of this series have been noted (E. S. R., 46, p. 223; 50, p. 430).

Inheritance in wheat, I, II, (*Jour. Genetics, 16 (1925), No. 1, pp. 1–18, pl. 1; 19–32, figs. 2*).—Two studies are reported.

I. *An "unfixable wheat" (investigation on the late M. Philippe de Vilmorin's "race de blé nain infixable")*, F. L. Engledow and S. M. Wadham.—An intensive study at Cambridge of the characteristics and genetic behavior of the dwarf wheat of de Vilmorin (E. S. R., 30, p. 441), considered with analogous cases, suggested that the general phenomenon had not yet been accurately described nor its constancy determined. Some chromosomal irregularity might be suspected as the basic cause, and cytological studies may clarify the problem.

II. *T. turgidum × T. durum crosses, with notes on the inheritance of solidness of straw*, F. L. Engledow and J. B. Hutchinson.—The inheritance of spike and kernel characters, endosperm texture, and solidness of straw were studied in *Triticum turgidum* × *T. durum* crosses.

Shape of spike and also pubescence of glumes were apparently due to single factors. In striking contrast to the *T. polonicum* × *T. durum* cross (E. S. R., 50, p. 27), wherein length of grain and glume appeared both to be governed by a single factor in *T. turgidum* × *T. durum* grain and glume length seem to have separate factors, and at least two grain length factors exist. Thus *T. turgidum* must be very different genetically from *T. polonicum* and *T. durum*, although each possesses 14 chromosomes. Definite conclusions were not obtained regarding color, endosperm texture, grain shape, resistance to *Puc-*

cinia glumarum, and tillering. The grains of the F_1 plants showed the *T. durum* endosperm type to be completely dominant. Regarding inheritance of solidness of straw, the Polish type of solidness seemed simply dominant (unifactorial) to the *T. turgidum* type, but factors for straw size in segregation produce secondary types. Solidness of straw appears to be neither linked to nor genetically inseparable from any other wheat plant character.

The heredity of unilateral variations in man, C. H. Danforth (*Genetics, 9 (1924), No. 3, pp. 199–211*).—For conducting this study of variation, 157 pairs of structures ordinarily bilaterally symmetrical were dissected in 20 subjects, and it was found that the structures deviated from the normal in from 7 to 9 per cent of the cases. Some of the variations were unilateral and some bilateral, but no differences in the germinal origin of the 2 types were apparent. It appears that modifying factors are largely responsibe in hereditary cases, and in many cases truly inherited the trait fails to appear. The sides of the body and the sex may favor or retard the appearance of such variations.

Inheritance of twinning in a herd of Holstein cattle, R. H. Lush (*Jour. Heredity, 16 (1925), No. 8, pp. 273–279, figs. 5*).—A study of the available data indicated that 0.98 per cent of the births in dairy cattle are twins, as compared with 8.84 per cent of the births among the Holstein cattle at the Kansas Experiment Station. The twinning percentage of the Holsteins in this herd was considerably higher than that for the other breeds. There was a tendency toward more frequent twinning among the offspring of certain bulls and among the dams related to certain bulls. One bull produced 19.15 per cent twins, which is attributed to his relation to Hengerveld de Kol, his maternal great-grandsire and his paternal grandsire. The influence of the breeding of the dams was apparent but did not appear to be as important as the breeding of the sire. Age, season, and production had no noticeable influence on the amount of twinning.

Albinism in maize (*Carnegie Inst. Wash. Yearbook 24 (1924–25), p. 40*).—Genetic analysis of white corn seedlings (E. S. R., 54, p. 628), continued by M. Demerec cooperating with R. A. Emerson, gave indications that in most of the types of white seedlings investigated albinism is determined by genetically different factors. The linkage relations between several other factors were observed in the same material used in the albinism study. In this way were found linkage between W_{11} w_{11} and *Shsh* with 22 per cent crossing over, between D_3 d_3 and *Shsh* with 23 per cent crossing over, between Gm_1 gm_1 and *Rr* with 31 per cent crossing over, and a linkage between V_4 v_4 and *Susu* with 33 per cent crossing over. Investigations with zebra-like striped leaves in corn showed that zebras found in different varieties were determined by four genetically different factors.

Linkage of a dilute color factor and dark-eye in mice, J. A. Detlefsen and L. S. Clemente (*Genetics, 9 (1924), No. 3, pp. 247–260*).—Data are presented showing the amount of crossing over occurring between the dilute color factor c^d and the dark-eye factor *P* in mice. The values obtained were in general lower than those found by Dunn (E. S. R., 44, p. 67) for dark-eye and color, which is an allelomorph of the dilute color factor. A statistical analysis of the data showed some advantage for a revised method of calculating probable errors when the presumptive total number of crossovers is derived from a single visible parental class or a single visible crossover class. A prenatal elimination of the pink-eyed forms in these experiments was indicated. A later paper referring to linkages in the same series has been noted (E. S. R., 53, p. 523).

Species crosses in Nicotiana, with particular reference to N. longiflora×N. tabacum, N. longiflora×N. sanderae, N. tabacum×N. glauca, W. S. and F. W. Malloch (*Genetics, 9 (1924), No. 3, pp. 261–291*).—In studies at the Universities of Illinois and California seed from the species hybrids *N. bigelovii×N. longiflora, N. bigelovii multivalvis×N. sanderae, N. rustica×N. langsdorffii, N. tabacum×N. alata grandiflora,* and *N. tabacum×N. longiflora* germinated but died in the seedling stage. The success of a species cross may sometimes depend on environmental conditions, the particular variety of the species used, and the compatibility of the different reaction systems. Sterility of the species hybrids may be explained on the basis that a high percentage of the chromosomes of a given parent are necessary to produce a functional gamete.

The hybrid *N. longiflora×N. tabacum* var. "Little Dutch" is a weak hybrid resembling *N. tabacum* with a few longiflora and some new characteristics, and is practically sterile. *N. longiflora×N. sanderae* is a highly sterile, vigorous form, the F_1 plants except in a few characters resembling *N. sanderae.* "Reduced flowers," a quantitative character in *N. tabacum havanensis*, can be increased in percentage by hybridization.

A new fertile hybrid between Aegilops and wheat [trans. title], L. Blaringhem (*Compt. Rend. Acad. Sci.* [*Paris*], *181* (*1925*), *No. 21, pp. 807–809*).—*A. ventricosa×Triticum turgidum* gave rise to a plant which when pollinated by *T. turgidum* bore several viable kernels. The technique employed and the characteristics of the parents and progeny are set forth.

A study of sex determination [trans. title], A. R. Minenkov (*Nauch. Agron. Zhur.* (*Jour. Landw. Wiss.*), *1* (*1924*), *No. 1, pp. 29–47, figs. 4*).—Investigations of the oxidase content of the leaves and sprouts of hemp showed that the female plants had a definitely higher oxidase content than the male plants. Similar results were obtained in tests with willow and nettle leaves. In further experiments the content of oxidase in the blood of 16 pregnant women during paturition was found to be distinctly higher for those who gave birth to girls than for those who produced boys. It is concluded from these experiments that the activity of oxidase and tyrosinase of female plants and animals is greater than that of male plants and animals. More carbonic acid is liberated by the tissues of female individuals. The degree of the reaction is changed during the vegetative period in plants, but the sex relations remain the same.

Data on the primary sex ratio in the mouse, E. C. MacDowell and E. M. Lord (*Anat. Rec., 31* (*1925*), *No. 2, pp. 143–148*).—The authors have determined the sex ratio in 106 litters of mice in which the numbers of offspring agreed with the numbers of corpora lutea counted in the ovaries (see below), and consider this the best approximation of the primary sex ratio since no prenatal mortality could have occurred in these litters. The sires of part of the litters were heavily treated with alcohol. Such litters were tabulated separately, but both groups showed a practical equality of sexes. In the normal litters there were 261 males and 262 females, and in the litters sired by the treated males there were 155 male and 152 female offspring.

The number of corpora lutea in successive mouse pregnancies, E. C. MacDowell and E. M. Lord (*Anat. Rec., 31* (*1925*), *No. 2, pp. 131–141, figs. 4*).—The number of corpora lutea in the ovaries of 123 mice have been determined in successive pregnancies by the method previously described (E. S. R., 52, p. 631). One-half of the females were treated with alcohol, and the results for this group are given separately. The data for both stocks showed that the number of corpora lutea increased with successive pregnancies, but there was a specially marked increase between the first and third litters. There appeared

to be no tendency to decline even in the ninth to the eleventh litters. The coefficients of correlation between the numbers of corpora lutea found and the parity are given in the following table:

Coefficients of correlation between number of corpora lutea and order of litter

Kind of female	All litters	First to third litters	Later litters
Normal	+0.359±0.033	+0.389±0.042	+0.165±0.055
Treated	+0.369±0.034	+0.428±0.041	+0.176±0.063

The classification of the number of corpora lutea according to the age of the female and according to parity were very similar. The four different inbred strains of mice showed distinctive characteristics in the numbers of corpora lutea found in successive litters which were assumed to be genetic.

Studies in vigor.—V, The comparative activity of male and female albino rats, F. A. Hitchcock (*Amer. Jour. Physiol., 75 (1925), No. 1, pp. 205–210, fig. 1*).—In continuing the studies in vigor (E. S. R., 54, p. 730), records on 35 male and 36 female white rats from January to June showed that the activity of the females was 56 per cent greater than that of the males. Some evidence of seasonal activity was indicated in these animals, as there was a marked rise in activity in most of them with the coming of spring. The variability in activity of males was as great as that of females, but it was not cyclic.

Studies on vigor.—VI, The effect of starvation on the spontaneous activity of castrated rats, R. G. Hoskins (*Endocrinology, 9 (1925), No. 5, pp. 403–406, fig. 1*).—In continuing the series of studies noted above, the daily voluntary activity of each of 10 castrated rats is reported for 7 days on normal rations, followed by 6 days for 6 of the animals and 4 days for 4 of the animals during which no food other than water was given. The activity is also reported for the 11 days of normal feeding following the starvation period.

The average results showed that the daily activity increased during the starvation period to a maximum on the fourth to sixth days of approximately 3 times that of the initial period. The average activity returned almost to normal on the second day after full feeding.

On the excess mortality of males in the first year of life, M. Greenwood and E. M. Newbold (*Biometrika, 17 (1925), No. 3–4, pp. 327–342, figs. 3*).—Data relative to the mortality of male and female infants in England and Wales and in London are presented, primarily for the purpose of analyzing the methods used by F. Lenz [1] in a paper on infant mortality.

FIELD CROPS

The field experiment [trans. title], T. Roemer (*Arb. Deut. Landw. Gesell., No. 302, 2 enl. ed. (1925), pp. 132, pl. 1, figs. 3*).—A revised and enlarged edition of the study described earlier (E. S. R., 45, p. 529) is presented, with a list of 176 citations.

[Field crops work at the Waseca, Minn., Substation, 1919], R. E. Hodgson (*Minnesota Sta., Waseca Substa. Rpt. 1919, pp. 10–14, fig 1*).—Variety tests with winter and spring wheat, barley, and corn, seeding trials with winter wheat, and breeding work with corn are reported briefly. The continuation of these tests has been noted (E. S. R., 47, p. 333).

[1] Arch. Hyg., 93 (1923), pp. 126–150.

[Field crops work at the Waseca, Minn., Substation, 1919–1923], R. E. HODGSON (*Minnesota Sta., Waseca Substa. Rpt. 1919–1923, pp. 8–21, 22, 23, 25, 26, figs. 2*).—Investigational work reported on included breeding work with small grains and corn, varietal trials with spring wheat, oats, barley, sweet clover, and alfalfa, varietal and seeding tests with winter wheat, rye, and soy beans, tests of soy beans in mixtures and of alfalfa with nurse crops, and demonstrations of tillage methods with alfalfa.

[Field crops work at the Raymond, Miss., Substation, 1925], H. F. WALLACE and C. B ANDERS (*Mississippi Sta. Bul. 231 (1925), pp. 3–9, 14–16*).—Investigations continuing earlier work (E. S. R., 53, p. 332) comprised variety trials with cotton, corn, and soy beans, fertilizer tests with cotton and corn, a spacing test with cotton, and a comparison of certified potato seed. Variety and fertilizer recommendations were similar to those already noted.

[Field crops work at the South Mississippi Substation, 1925], E. B. FERRIS and W. S. ANDERSON (*Mississippi Sta. Bul. 232 (1925), pp. 4–9, 16*).—Further experiments (E. S. R., 53, p. 231) included variety and fertilizer tests and breeding work with sweet potatoes, variety trials with soy beans, and production tests with early cowpeas resistant to nematodes, Cayana No. 10 sugar cane, lespedeza, and winter cover crops.

Corn grown alone made 35.6 bu. per acre and with soy beans 29.9 bu., with cowpeas 29.5 bu., and with velvet beans 13.6 bu.; cowpeas alone made 32.2 bu. per acre and 19.7 bu. with corn; soy beans alone made 12.1 bu. per acre and 6.9 bu. with corn; and velvet beans did not fruit at all when grown alone and made about 21 bu. with corn.

[Field crops work at the Holly Springs Substation, 1925], C. T. AMES (*Mississippi Sta. Bul. 233 (1925), pp. 4–28, figs. 3*).—Investigations (E. S. R., 53, p. 131) reported on for 1925 comprised variety trials with corn, cotton, soy beans, alfalfa, and sweet potatoes, spacing tests with cotton and sweet potatoes, fertilizer tests with corn and cotton, and interplanting of corn with soy beans and velvet beans. Information is presented for the growing of the above crops and sorgo for silage, vetch, alfalfa, and lespedeza. The dairy possibilities in the section are considered very promising.

[Field crops experiments in North Carolina, 1924–25], C. B. WILLIAMS and C. D. MATTHEWS (*North Carolina Sta. Rpt. 1925, pp. 17–21, 35, 36*).—Comparisons of varieties of wheat, corn, oats, barley, rye, soy beans, vetch, and strains of crimson clover and lespedeza, and breeding work with cotton, corn, soy beans, and sorgo are reported on as heretofore (E. S. R., 53, pp. 734, 736).

Early preparation of the seed beds, delinting seed with sulfuric acid, cleaning and grading seed, and planting during the latter part of April, were each conducive to enhanced yields of seed cotton. Spacing tests are also noted.

Comparative trials indicated that vine cuttings of sweet potatoes planted concurrently with slips will outyield the slips. Cutting of vines resulted in a loss of production proportionate to the amount of cutting. The higher yields have accrued from the closer spacings and higher ridging. Crate storage was superior to ordinary bin storage. Seed selected from high yielding hills had progeny yielding higher than the average seed of the parent variety. Continuous selection within the hill line did not improve the type or yield within the strain.

Immature seed potatoes raised at the Mountain Substation were inferior to mature seed, and the North Carolina mountain certified Cobbler seed equaled Maine certified Cobbler seed in yield and earliness. Although rather favorable results were obtained in the greenhouse under field conditions, seed potatoes were not stimulated to early maturity or higher yields by treatment with sodium nitrate solution.

[Agronomic work in the Philippines] (*Philippine Agr. Rev., 18 (1925), . 3, pp. 255–282, 291–295, 299–318, pls. 18*).—The following articles of agronomic interest are included in the pages indicated:

A Report on Sugar Cane Investigations in the Province of Batangas, by S. Asuncion; A Progress Report on the Peanut Variety Test at the Lamao Experiment Station, Lamao, Bataan; A Preliminary Report on Spacing of Corn at the Lamao Experiment Station, Lamao, Bataan; and A Preliminary Report on the Acclimatization of Pop Corn at the Lamao Experiment Station, Lamao, Bataan, all by F. G. Galang and P. L. Paulino; A Descriptive List of Some Forage Grasses for Distribution by the Bureau of Agriculture for Trial Planting; A Catechism on Mongo [Mung] Production, by F. P. Octubre; and The Growing of Sugar Cane in the Philippines, by S. Asuncion.

[Agronomic investigations of the Agricultural Research Institute, Pusa, 1924–25], F. J. F. Shaw, J. Sen, G. S. Henderson, and W. Sayer (*Agr. Research Inst., Pusa, Sci. Rpts. 1924–25, pp. 12–20, 29, 30, 67–75, 152–163, pl. 1*).—Experiments and breeding work with different field crops are reported on as heretofore (E. S. R., 53, p. 531). In a report of the Sugar Bureau, Sayer describes tests of seedling and exotic sugar canes, mill trials, and cultural experiments, and indicates the status of the industry.

[Field crops experiments in Guadeloupe, 1923–24 and 1924–25], C. T. Allder (*Guadeloupe Sta. Agron. Raps., 6 (1923–24), pp. 8–25, 31–59; 7 (1924–25), pp. 4–27, 35–55*).—These pages report the continuation of earlier work (E. S. R., 51, p. 636).

A study of some Indian grasses and grasslands, W. Burns, L. B. Kulkarni, and S. R. Godbole (*India Dept. Agr. Mem., Bot. Ser., 14 (1925), No. 1, pp. 57, pls. 5, figs. 12*).—Grasslands (E. S. R., 51, p. 34) in the Deccan, in Gujarat near Bombay, and in the southern Maratha country are described from intensive studies made by the quadrat and survey methods. The effects of inclosure, burning, and other treatments are indicated. Seeding trials led to the conclusion that artificial reseeding of natural pastures will be rarely applicable as a means of renovating depleted grasslands. Burning tended to produce a more xerophilous type of vegetation. Characteristics of important species found on the grassland, including *Andropogon contortus*, *A. annulatus*, *A. caricosus*, *A. pertusus*, and *Aristida* spp., are set forth.

Spring grains: Time of seeding and comparative yields, L. L. Zook (*Nebraska Sta. Bul. 213 (1926), pp. 12, figs. 2*).—Seeding tests with spring wheat, barley, rye, oats, and emmer during 17 years at the North Platte Substation and trials for 7 years at the station (E. S. R., 52, p. 529) suggest that higher yields usually may be expected from early than from late seedings of spring grains.

Seeding time will vary considerably from year to year on account of climatic conditions. The best time for seeding in eastern Nebraska is usually between March 15 and April 1, in central Nebraska between March 20 and April 5, and in western Nebraska between March 25 and April 10. Seeding may be made with reasonable safety as early as a seed bed can be prepared after the frost leaves the ground.

On the basis of hull-free grain, barley, followed by spring rye, led the spring grains in yield at both North Platte and Lincoln, while oats were third at Lincoln and spring wheat third at North Platte.

Cereal growing in Alaska, C. C. Georgeson and G. W. Gasser (*Alaska Stas. Bul. 6 (1926), pp. 40, figs. 19*).—The factors involved in cereal production in Alaska, including climatic and soil conditions, clearing land, cultural problems, production methods, maintenance of soil fertility, and marketing of the

crop, are discussed in the light of experimental results and experience. The characteristics of varieties of wheat, rye, barley, and oats tested by the stations are indicated, and the progress and results of hybridization work with these cereals are summarized. Hybrids are listed with brief descriptions.

Experiments with alfalfa in eastern Virginia, R. P. Cocke (*Virginia Sta. Bul. 247 (1926), pp. 16, figs. 5*).—Experiments made on Norfolk sandy loam near Williamsburg, concerned with the culture of alfalfa, are reported, together with information on production practices.

Liming tests suggested that 0.5 ton of burnt lime or 1 ton of ground limestone applied before each seeding is ample for the lime requirements of the crop in this section. Fertilizer trials on both light and heavy soils indicated that farmyard manure at the rate of 10 tons per acre supplemented by 400 lbs. of acid phosphate sufficed to insure good yields of alfalfa hay. When manure is not available a complete fertilizer high in phosphorus and potassium is recommended. Varietal trials indicated that the best source of alfalfa seed for eastern Virginia is the northern alfalfa seed producing area of the United States. Fall seeding should be made during late August or early September. An acre rate of from 20 to 25 lbs. of seed is suggested. The stand did not seem to be successfully maintained beyond the third year by any of the top-dressings applied in the second year after seeding. Cultivated plats were as badly weed infested as uncultivated. Manure reduced rather than increased the weeds in alfalfa.

The history of the beet as a crop plant, E. O. von Lippmann (*Geschichte der Rübe (Beta) als Kulturpflanze. Berlin: Julius Springer, 1925, pp. VI+184, pl. 1*).—This volume traces the agricultural history of *Beta vulgaris* from the days of ancient Greece to the nineteenth century. A chapter deals with the origin of the beet. An extensive list of citations is included.

The caroa fiber (*Pulp and Paper Mag. Canada, 23 (1925), No. 30, pp. 811, 812, 821, 822, figs. 2; abs. in Jour. Soc. Chem. Indus., 44 (1925), No. 47, pp. B911, B912*).—Laboratory experiments and semicommercial trials indicated that caroa (*Neoglazovia variegata*), widely distributed in Brazil, can be profitably utilized in the textile industry. After digestion with about 10 per cent of sodium hydroxide (on the weight of dry material) at 2 to 3 atmospheres for 3 hours, followed by rolling, the resulting fiber is thoroughly washed, dried, and again rolled.

Caroa fibers thus obtained are yellow-green in color, are less translucent but "feel" more rigid than raw jute, and vary from 80 to 100 cm. in length and from 0.2 to 0.045 mm., averaging 0.09 mm. in thickness. The breaking load averaged 340 gm. (ranging from 690 to 160 gm.), equivalent to a breaking length of 44.1 meters. Chemical examination showed 78 per cent of cellulose and 12.1 per cent of pentosans. The ultimate fibers, which are smooth, taper gradually to a point, and have a rarely visible internal canal, vary from 2 to 6 mm. (average 4 mm.) in length and from 0.008 to 0.012 mm. (average 0.01 mm.) in width.

Attempts were made to use the fiber for the manufacture of paper.

Varieties of maize in New South Wales, H. Wenholz (*N. S. Wales Dept. Agr., Farmers' Bul. 152 (1925), pp. 87, figs. 58*).—Eighty varieties of corn which are important in New South Wales or have experimental significance are described and classified as to maturity and as to type.

Cotton varieties, T. S. Buie (*Clemson Agr. Col. S. C., Ext. Circ. 75 (1926), pp. 8, figs. 2*).—The significance of earliness, wilt resistance, and lint length in cotton varieties is indicated briefly, and based on experiments at the South Carolina Experiment Station and the experience of farmers in the State, Cleve-

land cotton is recommended for short staple production on wilt-free land and Dixie Triumph on wilt-infested land, and Lightning Express, Deltatype Webber, or Carolina Foster for long staple production.

Flax, N. A. Lazarkévitch (*Le Lin. Paris: Gauthier-Villars & Co., 1925, pp. IX+407, pls. 5, figs. 158*).—This French edition of a work originally published in Russian in 1921 deals in its successive parts with the culture of flax in its various phases, the preparation of flax fiber, the world production of flax fiber, the world linen industry, and the commercial status of the crop. In addition to an ample bibliography are appended plans for different types of factories for working flax fiber, the Russian standards for flax and tow, and a list of the flax spinners in Europe and the United States.

Flax in Montana, C. McKee (*Montana Sta. Circ. 132 (1926), pp. 3–16, figs. 16*).—Cultural methods and harvesting practices are suggested for the production of seed flax in Montana, with notes on the status of the crop, varieties, wheat-flax mixtures, and causes of flax failures.

Winter field peas: Their value as a winter cover and green-manure crop, H. N. Vinall and W. J. Davis (*U. S. Dept. Agr., Dept. Circ. 374 (1926), pp. 13, figs. 2*).—The Gray Winter and Austrian Winter field peas are described, with summary reports of field tests of these varieties in different localities in the country and brief cultural and fertilizer suggestions.

The range of usefulness of the winter pea will perhaps be limited to the southern Coastal Plain on the Atlantic coast and to the Pacific slope in Washington and Oregon. The trials to date indicate that winter peas are of little value in the North Central States, and their behavior along the Gulf coast west of Georgia has not been encouraging. Their poor showing in Alabama, Mississippi, and Louisiana seemed partly due to subnormal rainfall.

Trials of the cropping capacities of potatoes (*Jour. Min. Agr. [Gt. Brit.], 32 (1926), No. 10, pp. 929–932*).—Variety trials with potatoes conducted in England and Wales (E. S. R., 47, p. 827) during the period 1920–1924 are summarized.

Reviewing trials with cut and whole sets of potatoes, J. H. Priestley (E. S. R., 53, p. 236) reports the data as showing that, while sets cut and kept protected from sun and drying wind have generally outyielded sets cut and exposed for a few hours, no experiments suggest that protected cut sets are more liable to misses than whole sets. Contrariwise, sets left dry often show a high proportion of misses, and reduced yield per plant is occasionally noted.

[The fertilizing of potatoes] (*Jour. Min. Agr. [Gt. Brit.], 32 (1926), No. 10, pp. 883–903*).—The following articles are summaries of papers presented at a conference on the fertilizing of potatoes at Rothamsted on November 20, 1925: Manurial Requirements of the Potato Crop, by J. Russell; The Manuring of Potatoes—the Rothamsted Experiments, by T. Eden; Lincolnshire Experiments on the Manuring of Potatoes, by J. C. Wallace; and The Manuring of Potatoes—Trials in the North of England, by R. W. Wheldon.

The manuring of potatoes: Summary of points arising at the Rothamsted conference, C. Heigham (*Jour. Min. Agr. [Gt. Brit.], 32 (1926), No. 10, pp. 903–906*).—This article summarizes the points developed in the above conference, touching on the status of the crop in Great Britain, disease, organic, nitrogenous, phosphatic, potassic, and complete fertilizers, effects of cultivation, and experimental methods.

Report of the Government sugarcane expert, T. S. Venkatraman (*Agr. Research Inst., Pusa, Sci. Rpts. 1924–25, pp. 142–151, pl. 1*).—Research work with sugar cane at Coimbatore is reviewed with accounts of breeding and selection work, the incidence of disease, the performance of Coimbatore seedlings, and maintaining the health and vigor of varieties.

Attempts to obtain a method for germinating sugar cane pollen other than on the stigmas of *Datura fastuosa* proved futile. Cane arrows could be partially fed by vertically separating a tongue of cane some distance below the arrow and inserting the free half into special solutions, which reached the top portions of the arrow in less than 12 hours. Certain solutions appear to affect the color as well as the extent of opening of the anther sacs.

The culture of sugar cane, K. E. Kempski (*Die Zuckerrohrkultur. Berlin: Paul Parey, 1924, pp. 64, figs. 27*).—A concise account of sugar-cane production, giving particular consideration to conditions in the Dutch East Indies and including an extensive bibliography.

Windrowing of sugarcane, J. Sen (*Agr. Research Inst., Pusa, Sci. Rpts. 1924–25, pp. 24–26*).—Continuing his earlier studies (E. S. R., 53, p. 533), P. B. Sanyal concludes that rainfall is the prime factor determining the period during which sugar cane can be stored in good condition by field windrowing. A temperature above 25° C. (77° F.) was observed to be harmful. Although cane in Bihar can often be preserved by field windrowing during the cooler months, deterioration may take place later with rise in temperature and occasional rainfall. Sugar cane shade windrowed and protected from sun and rain can be successfully stored for longer periods than in the field. The deterioration of windrowed cane apparently indicates the inception of the process of germination of the buds.

Both whole and cut sets from Co. 213 cane windrowed and left standing were soaked in water before planting. High germination of the buds of windrowed canes demonstrated that the vital processes in the canes continue for some time. Sets of both fresh and windrowed canes germinated quicker when previously soaked in water, supporting the view that the entry of water diffuses the enzymes from the nodes to the internodes and thus stimulates germination. Germination was quicker and more thorough when the canes were soaked in sets than when soaked whole.

Deterioration of sugar cane during its storage by windrowing, P. B. Sanyal (*India Dept. Agr. Mem., Chem. Ser., 8 (1925), No. 7, pp. 105–126*).—A detailed account is presented of the investigations leading to the above conclusions.

The BH 10 (12) and SC 12 (4) canes, A. H. Rosenfeld (*Jour. Dept. Agr. Porto Rico, 9 (1925), No. 3, pp. 215–247, pls. 3, figs. 12*).—Barbados Hybrid 10(12) and St. Croix sugar canes are described, and their behavior in Barbados, Porto Rico, and other islands in the West Indies is summarized.

These varieties, both bred by J. R. Bovell in Barbados from B. 6835, are the most popular canes in Porto Rico and are replacing older standard varieties, particularly under the optimum conditions on the south coast where they probably occupy 50 per cent of the cane area. For many years in experiments in the British West Indies the B. H. 10(12) has been outstanding. S. C. 12(4) has consistently given the best results of varieties grown in St. Croix. These canes have lately been promising in both Cuba and Dominican Republic, S. C. 12(4) cane probably arousing more enthusiasm than B. H. 10(12). The two varieties have been equally superior to other kinds on the coastal plains of Porto Rico, while in the hills between Humacao and Caguas S. C. 12(4) seems slightly the better adapted.

Sudan grass, H. D. Hughes and F. S. Wilkins (*Iowa Sta. Bul. 233 (1926), pp. 123–149, figs. 10*).—Cultural methods and field practices are suggested for growing Sudan grass for hay, seed, and pasture as the result of extensive experiments at the station. The advantages of the crop, its diseases and insect pests, and its effect on the yields of crops following in the rotation are described briefly.

Nothing seemed to be gained by seeding before May 15, the yield being reduced about 0.5 ton per acre for each week of delay after June 1. Seeding by broadcasting and harrowing or in narrow rows with a grain drill was found most practical for hay or pasture production. Seeding in rows and cultivating may give slightly higher hay yields, but the cost of cultivation, difficulty in harvesting, and the coarser hay produced do not favor the practice. However, slightly higher seed yields may be expected when Sudan grass is drilled in rows wide enough to permit individual row cultivation. The most profitable seeding rates appeared to be 15 to 20 lbs. per acre for hay or pasture broadcasted or in narrow drills and for seed 10 lbs. broadcasted or drilled in 8-in. rows. Seed from different parts of the United States yielded similarly, and no other differences of significance were noted.

While higher yields of better quality hay were had from two cuttings than one, the difficulty of curing and the extra labor involved with two cuttings suggest cutting only once and pasturing the aftermath. When two hay crops are desired, the first should probably be cut when the grass is heading and the second just before frost. The single crop may be cut when the seed is in the milk to soft dough stage, although the grass may be cut from the beginning of heading until in the hard dough stage. Sudan grass may best be cut for seed when three-fourths of the seed are ripe and hard.

The use of Sudan grass in mixtures with soy beans has been described elsewhere (E. S. R., 53, p. 636). Sudan grass has failed in each of the three years that it was seeded with oats at the regular oat seeding time, whereas oats seeded with and without Sudan grass yielded practically the same each year.

Improving sunflowers by inbreeding, R. I. Hamilton (*Sci. Agr., 6 (1926), No. 6, pp. 190–192, figs. 5*).—Strains of sunflowers inbred at the Central Experimental Farm at Ottawa during several years could be classified into a single stalk type and types with short branches, branches parallel to main stalk, and wide spreading branches. Within these types occurs great variation in plant size, shape and quantity of leaf, and other morphological characters. Certain strains with branches parallel to the main stalk seem to be heavy yielders of leafy forage. Contrary to common belief the better multiheaded types gave more grain than single headed sorts. The results of the inbreeding in general approximated findings in corn. A very marked increase in the uniformity of the strains concerned with a corresponding reduction in plant size resulted in the first three years. Unlike corn, a number of strains became extremely uniform without losing their former vigor. It appears possible to combine into an inbred strain more desirable growth factors than are possessed by the average of an open fertilized population.

Review of nation-wide sweet clover experience in sugar beet rotations, L. W. Kephart (*Through the Leaves, 14 (1926), No. 1, pp. 35, 36*).—The status of the sweet clover crop in the sugar beet producing sections is summarized briefly.

[Tobacco investigations at the Connecticut Tobacco Substation], P. J. Anderson, N. T. Nelson, and D. F. Jones (*Connecticut State Sta., Tobacco Substa. Bul. 6 (1926), pp. 3–59, figs. 5*).—Experiments with tobacco reported on for 1925 embraced the continuation of extensive fertilizer trials (E. S. R., 54, p. 134), tests of Havana seed strains and Broadleaf strains, improvement of shade tobacco by hybridization and selection, and studies of the effects of cover crops on tobacco.

Cropping tests with tobacco, D. E. Brown and W. M. Lunn (*Maryland Sta. Bul. 275 (1925), pp. 21–48, figs. 8*).—Investigations in cooperation with the

U. S. Department of Agriculture have been essentially noted from another source (E. S. R., 54, p. 31).

Further observations on root development [in wheat], R. D. LEES (*Agr. Gaz. N. S. Wales, 37 (1926). No. 1, pp. 17–19*).—Investigation of the effects of superphosphate application on the root development in wheat (E. S. R., 52, p. 736) was continued at the Wagga Experiment Farm.

The stimulation of superphosphate appeared to enable the roots to penetrate quickly and deeply into the subsoil and to increase the feeding area. Fallowing seemed essential for the best results from superphosphate. The longer growing season of an early sown variety led to greater root development than with a late seeded wheat, although roots of the latter developed more rapidly. The root development during a good season was more uniform than in an abnormal season.

The influence of environment on the protein content of wheat, F. T. SHUTT (*Canad. Chem. and Metall., 9 (1925), No. 9, pp. 195–197*).—An investigation conducted on a number of the Canadian experimental farms (E. S. R., 53, p. 529) showed that environmental conditions during growth, i. e., meteorological conditions, the soil, and cultural practices, have noticeably influenced the protein content of wheat grain.

The meteorological records showed that the districts producing the highest protein wheats are those especially characterized by markedly high maximum temperatures and low precipitations during the developing and ripening stages of the grain. Wheat grown on land recently cleared and broken contained less protein than the parent seed and still less than the same variety grown on adjoining land cultivated for several years. The difference was attributed to the higher moisture content of the recently broken soil throughout the growing season. Irrigated wheat produced at Lethbridge, Alta., and Invermere, B. C., had a much lower percentage of protein than comparable wheat grown on dry land. Data on prematurely ripened grain, including frosted grain, were not considered, since such wheat is much higher in protein than grain ripened normally.

Tillage in relation to milling and baking qualities of wheat, M. C. SEWELL and C. O. SWANSON (*Kansas Sta. Tech. Bul. 19 (1926), pp. 4–16, figs. 8*).—Methods of seed-bed preparation were studied as to their relation to the milling and baking qualities of wheat. See also earlier notes (E. S. R., 52, p. 439; 54, p. 440).

The experimental data indicated that the protein content in wheat is materially affected by the quantity of nitrates in the soil. The yield in bushels per acre and the quality of protein per acre correlate directly with the quantity of nitrates in the soil, which in turn depend upon the methods and time of tillage. The percentage of phosphorus varied inversely with the nitrates and the wheat yield per acre, whereas the quantity of phosphorus in the crop varied directly with the yield, showing that phosphorus was not the limiting growth factor.

The tillage treatments causing the most nitrates in the soil produced the largest wheat yield and the highest percentage of protein, and the flour from this wheat was also of superior quality as measured by loaf volume and texture. When applied in crop rotations, different tillage treatments greatly influenced the wheat yield and hence the quantity of protein per acre, but not the percentage of protein in the wheat and other factors indicative of milling quality.

Agricultural seeds from overseas: Effect of the voyage on germination capacity, A. W. S. MOODIE (*Agr. Gaz. N. S. Wales, 36 (1925), No. 12, pp. 877,*

878).—Further tests on seed transported from London to Sydney confirmed previously noted results (E. S. R., 52, p. 38), indicating that seeds stored under cool conditions with slight temperature variation are apt to retain their viability better than when stored under warmer conditions with great variations in temperature.

Results of seed and legume inoculant inspection, 1925, J. G. Fiske (*New Jersey Stas. Bul. 428 (1926), pp. 5–83, figs. 2*).—Tabulations show the purity and germination percentage for 550 official samples of field crops seed and 38 lawn mixtures, and the germination percentage for 898 samples of garden seed, and the crops, inoculation, number of organisms, and viability guaranties for 43 official samples of legume inoculants.

Weeds in modern agriculture, E. Korsmo (*Ugress i Nutidens Jordbruk. Oslo: J. W. Cappelen, 1925, pp. XI+694, pl. 1, figs. [411]*).—Weeds and their control are treated exhaustively in this book. They are classified biologically as weeds reproduced by seeds only, perennials reproduced by seeds but which may form shoots, and perennials reproduced principally by creeping shoots. The species considered are described in detail throughout their life cycle. The germinability of the seed at different depths is indicated, and the presence of weed seeds in chaff, hay refuse, seed mixtures, dung, etc., is shown. Tabulated analyses show the demands of weeds upon the soil and their feeding value for animals. The damage caused by weeds and their relative capacities for dissemination are pointed out, and means of control or eradication are outlined. The bibliography contains 147 titles.

The relation of climate to the spread of prickly pear, T. H. Johnston (*Roy. Soc. So. Aust. Trans., 48 (1924), pp. 269–296, figs. 4*).—A climatological study of the Opuntia regions of the world led to the conclusion that, if soil conditions be suitable, the pest prickly pear (*O. inermis*) will be capable of extending very considerably in eastern Australia, especially in Queensland, so that the total invaded area may be nearly three times the area now infested. The rest of Australia presents conditions which do not favor the spread of such cacti.

HORTICULTURE

[Horticultural investigations at the Colorado Station], E. P. Sandsten (*Colorado Sta. Rpt. 1925, pp. 31, 32*).—Fruit thinning in an experimental peach orchard resulted in 99 per cent of extra fancy grade, as compared to 60 per cent for unthinned trees. At the same time there was only a very slight difference in total production. Studies in lettuce culture in the mountain regions indicated the advisability of restricting tillage and irrigation.

Report of horticultural work at the South Mississippi Experiment Station for 1925, W. S. Anderson (*Mississippi Sta. Bul. 232 (1925), pp. 9–16*).—Brief reports are again presented (E. S. R., 53, p. 239) on the results of varietal and cultural tests with peaches and other fruits and vegetables. Improved varieties of blueberries from Whitesbog, N. J., failed to survive the summer season. Although many of the vinifera grapes grafted on American stocks died during the year, Chasselas-Fontainbleau on Catawba roots made excellent, vigorous growth. In a fertilizer test with tomatoes the largest yield increase was obtained on that plat receiving 450 lbs. of nitrate of soda, 600 lbs. acid phosphate, and 100 lbs. of sulfate of potash.

[Horticultural investigations at the North Carolina Station], C. D. Matthews (*North Carolina Sta. Rpt. 1925, pp. 35, 36–38*).—Of 17 cabbage varieties tested at the station, Copenhagen and Danish Ballhead were the most promising. The Eckles Sweet Red June apple was found resistant to

blight, a disease described as the principal limiting factor in apple production in eastern North Carolina. As compared with heavy pruning, light pruning of apple trees resulted in larger trees and earlier and greater production of fruit. Observations on peach varieties planted in western North Carolina in 1919 showed Crosby, Engle, and Kalamazoo to be extra hardy varieties. With respect to yielding quality, Schley, Stuart, Alley, and Success pecans were found to be superior varieties. With the addition of the Curtis, these varieties were also found superior in cracking qualities. Pecan trees eight years or less in age were successfully top-worked.

Studies of the inheritance of characters in *Vitis rotundifolia* showed that size of cluster and of berry and thickness of skin are inherited, but not as unit characters. Observations upon a race of self-fertile vines bearing unusually large flower clusters showed that these clusters failed to develop fully because of abortive pistils and impotent pollen. The adherence of berries in the rotundifolia group appears to be a lacking characteristic.

Attempts to hybridize *V. rotundifolia* with other related species led to various results. With Ampelopsis no success was obtained, while with grapes of the labrusca group seeds were secured when rotundifolia was used as the pollen parent. Hybrids, however, showed inferior vigor and marked sterility, and attempts to obtain an F_2 generation resulted in only three seedlings.

Some progress is reported in raspberry breeding.

[Horticultural investigations at the Rhode Island Station] (*Rhode Island Sta. Rpt. 1925, pp. 45, 46, 49*).—Further work with Hubbard squash (E. S. R., 54, p. 38) showed the blue variety to be much more prolific than the green. Japanese seed onions yielded only two-thirds as much as Southport Yellow Globe. Of six sweet corns, namely, Columbia, Crosby, Whipple Yellow, Catawba, Golden Bantam, and Bantam Evergreen, ripening in the order given, the Golden Bantam yielded the largest number of ears and the Whipple Yellow the greatest weight of ears per acre. New York Wonderful lettuce grown in the station greenhouse made large, solid heads, comparing favorably with California-grown Iceberg lettuce. A very satisfactory winter crop of tomatoes was grown from seed sown in August and planted in the greenhouse in October. Comet bore larger, but less total weight of, fruit than did Bonny Best during February and March.

A survey of apple varieties grown in Rhode Island showed the Baldwin to be the leading variety, with McIntosh gaining rapidly and Rhode Island Greening making little progress.

Gardening in the Virgin Islands, W. M. Perry (*Virgin Islands Sta. Bul. 6 (1926), pp. 19, figs. 5*).—General information is presented on the planning, preparation, planting, and care of the vegetable garden, including control of insect and fungus pests. The special cultural requirements of various vegetables are given.

1001 garden questions answered, A. C. Hottes (*New York: A. T. De La Mare Co., 1926, pp. 293, figs. 85*).—Concise practical information is presented on various problems connected with the growing of fruits, flowers, and vegetables.

[Variety and fertilizer tests with vegetables at the Raymond (Miss.) Substation], H. F. Wallace and C. B. Anders (*Mississippi Sta. Bul. 231 (1925), pp. 9–13, 16, 17*).—As in the preceding report (E. S. R., 53, p. 341), tabulated data are offered upon the results of miscellaneous tests. Records taken for two years show the best results from the use of 2,000 lbs. per acre of high-grade fertilizer as a treatment for tomatoes. The Marvel and Marglobe varieties, because of their resistant qualities, are recommended for wilt-infested soils. Staked tomato plants topped above the fourth cluster were

more productive than those more severely pruned. In a test of several nitrogen carriers, cottonseed meal gave better results than did nitrate of soda or ammonium sulfate. The largest yield was obtained on plats where the nitrogen was secured from all three different sources. A quantitative test of potash indicated the advisability of including this material in mixed fertilizers. Potash had no apparent effect on retarding the ripening of the tomatoes.

Fertilizer studies with garden peas showed 1,000 lbs. of high-grade material to be a profitable application. Nitrate of soda was the best source of nitrogen. With garden beans, the largest yields were secured with 1,500 lbs. of an 8-4-3 material. In the case of beans, ammonium sulfate was slightly more effective than nitrate of soda. Cabbage fertilizer tests showed that 1,500 to 2,000 lbs. of a 10-4-4 mixture is a profitable application.

A method of extracting tomato seed from sound, ripe fruits is described.

Effect of soaking seed of some vegetables before sowing, J. E. Knott (*Jour. Amer. Soc. Agron.*, *17* (*1925*), *No. 1, pp. 49–54*).—The immersion of seeds for 24 hours in shallow dishes of distilled water, held at 68° F., failed in the case of the tomato to show any accelerating effect on germination, and in the cases of beet and cabbage delayed the germination 4 to 9 hours, respectively, as compared with control lots. When planting was timed so that the soaked and unsoaked seeds germinated simultaneously, no effects could be found from soaking on the later development of the plants. The author believes that the stimulating advantage often claimed for soaking may lie simply in the initial head start of the soaked seed at a time when the plant is at its maximum efficiency.

Effect of cold temperature on growth of vegetables, J. E. Knott (*Jour. Amer. Soc. Agron.*, *17* (*1925*), *No. 1, pp. 54–57*).—Placing freshly planted flats of Crosby Egyptian beet and Copenhagen cabbage for 48 hours in a chamber held at a temperature of 32° F. had no effect either in inducing premature flower stalk formation or upon the general vegetative development of the plants. Similar flats of seed held at the minimum temperature permitting germination, namely, 41°, showed no effect in the later development of the plants from the low temperature, leading the author to conclude that depressed temperatures at some period in the growth of biennial plants, rather than low temperature during germination, is apparently the cause of premature flowering.

Cantaloupe culture with plants started under glass, M. M. Parker (*Virginia Truck Sta. Bul. 51* (*1925*), *pp. 383–394, figs. 3*).—Information is offered on the production of early cantaloupes in the Norfolk area of Virginia, discussing in detail the various operations of preparing the cold frames, planting the seed, preparing and fertilizing the soil, setting plants, choice of varieties, and control of insect and fungus pests.

Fertilizers for Connecticut Valley onions, A. B. Beaumont and O. E. Street (*Massachusetts Sta. Bul. 227* (*1926*), *pp. 44–46*).—Based upon earlier results secured by the station and upon investigations carried on in the summer of 1925, the authors conclude that a complete fertilizer is necessary for the continuous production of onions upon Connecticut Valley soils. The best results were secured with fertilizers having a high ratio of phosphoric acid, and moderate applications of lime were found beneficial.

The healing of wounds in woody stems, T. Swarbrick (*Jour. Pomol. and Hort. Sci.*, *5* (*1926*), *No. 2, pp. 98–114, pl. 1, figs. 7*).—Studies of the processes of healing in sycamore, rhododendron, plum, and apple pruning wounds made every month in the year showed that in favorable seasons (May to August) such wounds quickly protect themselves by the deposition in the dead tracheae

of a viscous substance, designated by the author as wound gum. In the same manner, but to a lesser degree, wounds made in September and October protected themselves. Wounds made in winter (November to April) healed hardly at all until the following spring, when they were rapidly and completely blocked with gum. While the exact chemical composition of the wound gum was not determined, the author believes it to be probably of an acidic nature, possibly a true gum when first deposited. As a practical deduction, the author suggests that spring and summer are apparently the most favorable seasons for pruning in so far as natural closure of wounds is concerned.

Fruit tree culture [trans. title], (*Min. Agr. [Belgium], Off. Hort., Rap. et Avis, 2. ser., No. 24,* [*rev. ed.*], *1923, pp. 35, figs. 30*).—A brief discussion of methods of culture involving the use of walls and sides of buildings as supports.

Spraying fruit plants, W. F. Pickett and L. C. Williams (*Kansas Sta. Circ. 125* (*1926*), *pp. 15, figs. 3*).—This circular discusses the preparation and application of sprays and outlines spray schedules for apples, plums, peaches, strawberries, and other tree and small fruits.

The progress of nursery tree certification, J. K. Shaw (*Massachusetts Sta. Bul. 226* (*1926*), *pp. 32, 33*).—A brief paper pointing out that nursery stock certification as sponsored by the Massachusetts Fruit Growers' Association has been very successful in maintaining the purity of varieties. In 1925 166,810 trees were certified.

The value for Massachusetts of some of the newer varieties of apples, J. K. Shaw (*Massachusetts Sta. Bul. 226* (*1926*), *pp. 13–15*).—Cortland, Delicious, Golden Delicious, and red sports of Delicious, Gravenstein, and Northern Spy are briefly discussed in respect to their possible value for Massachusetts orchards.

The apple situation, L. P. Jefferson and H. W. Yount (*Massachusetts Sta. Bul. 226* (*1926*), *pp. 10–12*).—Data obtained from approximately 1,750 orchardists representing over 600,000 bearing and 367,000 nonbearing apple trees, showed the Baldwin variety to be by far the most important in Massachusetts. McIntosh was second, and Gravenstein third. Older varieties, such as Rhode Island Greening, Northern Spy, and Russet, are fast losing ground, while Delicious has made important gains.

Effect of the stock on the scion, J. S. Bailey (*Massachusetts Sta. Bul. 226* (*1926*), *pp. 27–31, pls. 2, figs. 2*).—Data taken on Red Astrachan, McIntosh, Yellow Transparent, Baldwin, Wagener, and Tolman apple trees grafted upon their own roots and upon roots of other varieties showed great variability in behavior in relation to stocks. Baldwin, Red Astrachan, and McIntosh made their best growth on their own roots. All six varieties did very poorly on Oldenburg roots. Certain stocks, such as Ben Davis, Northern Spy, Red Astrachan, and Baldwin, gave uniformly good results with all six scions. In respect to fruiting, English Paradise, a dwarfing stock, apparently induced early bearing. McIntosh was most fruitful on its own roots.

Pruning young apple trees, J. K. Shaw (*Massachusetts Sta. Bul. 226* (*1926*), *pp. 22–27*).—Observations upon 9-year-old apple trees pruned according to various designs since planting in 1916 indicated that the type of pruning has little effect on the growth or fruiting capacity of the tree provided no severe cutting back is practiced. Of three types observed, namely, globular head, central leader, and modified central leader, the globular head was secured most easily. The cutting back of main side branches was found to decrease their diameter as compared with controls. The fewer the main side branches, the greater were their individual diameters.

Fruit production in the apple [trans. title], A. MANARESI and G. B. GARAGNANI (*Staz. Sper. Agr. Ital., 58 (1925), No. 1–6, pp. 19–124*).—Among the subjects considered are the spring development of the flower, the physiology of pollination, the effect of weather upon the setting of fruit, the physiology of fruit dropping, the relation of seeds to the size and setting of the fruit, etc.

Certain physical and chemical changes of Grimes apples during ripening and storage period, H. H. PLAGGE, T. J. MANEY, and F. GERHARDT (*Iowa Sta. Research Bul. 91 (1926), pp. 42–72, pl. 1, figs. 11*).—In this paper the authors report upon the results of studies of several tests for maturity, using as material Grimes apples harvested at different intervals and supplementing the simple physical test with chemical analyses of fruits at the time of storing and at the end of the storage period.

The mechanical pressure tester was not found reliable for fruits attached to the tree because of the very slow rate of change in hardness and the variable influence of color and size of the individual fruits on the readings. Cultural treatments affected pressure readings, apparently through their effect on the size and color of the apples. After harvesting the rates of change in hardness were increased, so that the pressure tester became of value in measuring changes in maturity.

Change in seed color was not found a reliable single index to picking maturity, since at times seeds reached full color before the fruit was ready to harvest. Color changes in the fruit when combined with other indexes, such as ease of separation from the spur, ripening of detached fruits, etc., were valuable in determining maturity. Size increase in fruits continued as long as the fruit remained on the tree, and was markedly influenced by rainfall. Therefore, this factor was not deemed of value in indicating ripeness.

Observations upon the development of apple scald in the different lots following their removal from storage showed no scald in the very mature lot, nor in any apples which were wrapped in oiled paper. Records of the percentage of internal breakdown in the several lots showed no correlation with the date of picking.

Chemical analyses showed a loss of moisture, acidity, dextrins, starch, and acid hydrolyzable materials in ripening fruits, accompanied by an increase in specific gravity, sugars, and soluble pectins. The time of picking or the condition of maturity at the time of picking, within certain limits, affected but little the ultimate chemical composition of the fruit in storage.

A color chart is presented to assist in determining Grimes maturity. The relation of the stage of maturity of apples at the time of harvest to their behavior in storage was discussed in an earlier paper (E. S. R., 52, p. 651).

The atmosphere contained in apples [trans. title], G. RIVIÈRE and G. PICHARD (*Jour. Soc. Natl. Hort. France, 4. ser., 27 (1926), Jan., pp. 50, 51, fig. 1*).—A brief note upon determinations of carbon dioxide, oxygen, and nitrogen contained in the pulp of freshly crushed ripe apples.

Raspberry varieties and their cropping, N. H. GRUBB (*Jour. Pomol. and Hort. Sci., 5 (1926), No. 2, pp. 131–136*).—Brief notes are offered on the behavior of raspberry varieties under test at the East Malling Research Station, England. Of the many kinds tested Pyne Royal and Lloyd George were found to be the most valuable varieties.

Hybridization and the Muscat Bonnet [trans. title], L. BONNET (*Prog. Agr. et Vitic. (Éd. l'Est-Centre), 47 (1926), No. 6, pp. 130–134, figs. 7*).—Of seven seedlings produced from a cross of the Muscat Alexander and Golden Queen grapes, all were white in color and only two possessed the musk flavor of the Alexander parent. One of these two is described and named Muscat Bonnet.

Root-grafting of the citrus tree [trans. title] (*Okitsu, Japan, Imp. Hort. Expt. Sta. Research Bul. 3 (1925), pp. [3]+11, pls. 3, fig. 1*).—Here is discussed a method of inarching fruit trees which has been successfully employed in Japan in the restoration of weakened citrus trees, such as the Thomson Navel orange. Decadent trees were found to recover their full vigor in three or four years after treatment. Two to four stocks 6 to 10 mm. in diameter are generally used in the operation, which may be carried out at any time in the year except late fall and winter.

Stock experiment with Thomson Navel orange [trans. title] (*Okitsu, Japan, Imp. Hort. Expt. Sta. Research Bul. 4 (1925), pp. [3]+29, pls. 10, figs. 7*).—Of various citrus forms, namely, the Yuzu, sweet, sour, Japanese Summer, and trifoliate oranges, used for inarching weakened Thomson Navel trees, originally worked on trifoliate stock, the Yuzu gave by far the best results, indicating that this form of citrus should be a desirable nursery stock for the propagation of the Thomson orange. Trifoliate stock was least valuable, stimulating the tree for only a brief period. Trees inarched with sour or Japanese Summer oranges made vigorous growth but produced few and low-quality fruits.

Propagating citrus by cuttings, F. F. Halma (*Calif. Citrogr., 11 (1926), No. 6, p. 225, figs. 4*).—In a greenhouse propagating frame provided with extra bottom heat and so constructed as to maintain a high humidity, very good success was obtained in rooting cuttings of various citrus plants, including Eureka and rough lemons and sour, Valencia, and Navel oranges, sweet orange seedling, Marsh grapefruit, and Dancy tangerine. In the absence of bottom heat the Marsh grapefruit cuttings failed to root. Trimming the leaves of the cuttings greatly reduced the percentage of rooting.

Bud selection in the Washington Navel orange.—VI, Progeny test of a dual limb variation, A. D. Shamel, C. S. Pomeroy, and R. E. Caryl (*Jour. Heredity, 17 (1926), No. 2, pp. 59–65, figs. 4*).—Orange trees propagated from a single parent limb which bore three distinct types of fruit, namely, typical Washington, typical Thomson, and a combination type yielded fruits comparable to those of the parent, thus bearing out the results secured in previously noted work (E. S. R., 54, p. 540).

Geographic factors in the Trinidad coconut industry, P. E. James (*Econ. Geogr., 2 (1926), No. 1, pp. 108–125, figs. 15*).—A brief account of the coconut industry on the island of Trinidad, West Indies, pointing out how certain environmental conditions have favored its success or failure.

Pine-apple growing, A. E. Collens, F. H. S. Warneford, and F. G. Harcourt (*Antigua: Govt., 1924, pp. 16*).—Brief popular information is presented on the culture of the pineapple.

The pecan in Oklahoma, D. V. Shuhart (*Oklahoma Sta. Circ. 59 (1926), pp. 23, figs. 9*).—A presentation of general information upon soil; varieties; propagation, including budding and grafting, planting, and pruning; general culture; and economic possibilities.

Hardy shrubs for landscape planting in Michigan, C. P. Halligan (*Michigan Sta. Spec. Bul. 154 (1926), pp. 79, figs. 43*).—With material arranged alphabetically according to genera, information is offered upon hardiness, habits of growth, special requirements, and decorative value of a large number of ornamental shrubs.

Arbor Day: Its purpose and observance, L. C. Everard (*U. S. Dept. Agr., Farmers' Bul. 1492 (1926), pp. II+18, figs. 5*).—A revision of an earlier noted paper (E. S. R., 49, p. 641).

FORESTRY

Glimpses of our national monuments (*Washington: U. S. Dept. Int., Natl. Park Serv., 1926 pp. III+72, pls. 2, figs. 33*).—This comprises information on the location, accessibility, and principal features of important national monuments.

[Forestry commission reports for the years ended June 30, 1924 and 1925], R. Dalrymple-Hay et al. (*N. S. Wales Forestry Comn. Rpts., 1924, pp. 15; 1925, pp. 17, pls. 4, figs. 4*).—The customary annual reports (E. S. R., 50, p. 545).

Common forest trees of Mississippi: How to know them, W. R. Mattoon and J. M. Beal (*Miss. Agr. Col. Ext. Bul. 32 (1925), pp. 80, figs. 78*).—In line with previously noted publications (E. S. R., 54, p. 541), this illustrated pocket manual is designed to assist in the identification of the commoner forest trees of Mississippi.

Trees and shrubs; food, medicinal, and poisonous plants of British Columbia, J. R. Anderson (*Victoria: Brit. Columbia Dept. Ed., 1925, pp. 165, pl. 1, figs. 90*).—Prepared primarily as a reference book for schools, this text contains simple descriptions of various trees, shrubs, and plants, pointing out their distinguishing features, uses, etc.

Origin of cleavage polyembryony in conifers, J. T. Buchholz (*Bot. Gaz., 81 (1926), No. 1, pp. 55–71, pls. 3, figs. 2*).—A study of cleavage polyembryony in various conifers led the author to conclude that this phenomenon of growth is a feature of the embryogeny which must have had its origin before the developmental selection within an ovule had become adjusted, under conditions when only one egg at a time was fertilized. It is suggested that cleavage polyembryony must have occurred before the present adjustment was perfected, wherein pollen tubes take part in the process of developmental selection, and is therefore a palingenetic character. Morphological evidence is presented which supports the explanation that most of the living conifers whose embryogenies are known, perhaps all of them, have passed through a stage of cleavage polyembryony.

Moisture as a factor in the germination of Scotch pine seed [trans. title], Schmidt (*Ztschr. Forst u. Jagdw., 58 (1926), No. 1, pp. 29–41*).—A contribution from the Forest Seed Testing Station at Eberswalde, Germany.

Wetting facilitated the removal of the wings from Scotch pine seed, but rendered the seed more susceptible to mechanical injury in the machine. Wetting also caused a rapid decline in viability unless the seeds were promptly dried out following treatment. Since the outer seed coat is often removed with the wings, the color of the seed is changed, which renders quite impossible the identification of the place of origin. A moderate wearing of the outer scales, such as occurs in a wing-removing machine, was found to have a slight accelerating and increasing effect on germination.

Comparison of diameter tape and caliper measurements in second-growth spruce, C. E. Behre (*Jour. Forestry, 24 (1926), No. 2, pp. 178–182*).—Volume computations based on a series of comparative measurements taken with diameter tape and with calipers on second-growth white and red spruce on Mount Desert Island, Me., showed such slight differences that the author concludes that practically no importance need be attached to the choice of instruments.

Comparison of caliper and diameter tape measurements of second-growth loblolly pine, L. H. Reineke (*Jour. Forestry, 24 (1926), No. 3, p. 306*).—A comparison of caliper and diameter tape measurements upon second-

growth loblolly pine showed no appreciable differences between caliper and tape readings.

Pulpwood in the Lake States, D. A. CROCKER (*Amer. Paper and Pulp Assoc., Woodlands Sect. Ser., 3 (1926), pp. 64, pls. 9, fig 1*).—A survey of the pulpwood situation in Michigan, Wisconsin, and Minnesota, accompanied by a general description of the types of forest growth and maps showing their location with relation to various pulp mills. Suggestions regarding forest management which should lead to continuous production are included.

DISEASES OF PLANTS

Handbook of plant diseases, founded by P. SORAUER (*Handbuch der Pflanzenkrankheiten. Berlin: Paul Parey, 4. ed., 1921, vols. 1, pp. XV+959, figs. 264; 2, pp. VIII+382, figs. 50; 1923, vol. 3, pp. VI+310, figs. 55; 1925, vol. 4, pp. XVI+483, figs. 218*).—The fourth edition of this work is intended to consist of five volumes. The first of these, on nonparasitic diseases of plants, has been elaborated by P. Graebner; the second, on plant parasites, by E. Riehm and G. Lindau; the third, also on plant parasites, by E. Köhler, R. Laubert, W. Wollenweber, H. Zillig, and G. Lindau; and the fourth volume, on injuries due to animals, by H. Blunck, K. Friederichs, F. Stellwaag, S. Wilke, F. Zacher, and L. Reh.

On the nature of disease resistance in plants, J. C. WALKER (*Wis. Acad. Sci., Arts, and Letters, Trans., 21 (1924), pp. 225–247*).—A somewhat systematic presentation is made of information and opinion in what is considered to be merely the main evidence as to the nature of disease resistance. A bibliography comprises 95 titles.

Report of the botanist, L. W. DURRELL (*Colorado Sta. Rpt. 1925, pp. 20–22*).—Summarizing the results of investigations conducted during the year, the author states he found that carbon dioxide from live plant tissue or germinating seed stimulated the germination of spores of oat smut by increasing the acidity. Similar results were obtained with spores of other fungi and with pollen grains. Measurements of surface tension of the infection drop gave indications that lowering the tension increased the germination of certain fungus spores.

The summer spores of black stem rust of wheat were found to survive the winter within the leaf sheaths of wild barley under suitable moisture conditions but they did not infect new plants in the spring, owing to their inability to escape from the leaf sheaths.

Studies of the rust situation in Colorado are said to indicate the migration of the rust from Texas and Oklahoma. The invasion is rather slow and is approximately two weeks later than local infection from barberries. This late invasion permits wheat to escape injury in regions where barberries have been destroyed.

Indiana plant diseases, 1921 and 1922, M. W. GARDNER (*Ind. Acad. Sci. Proc., 39 (1923), pp. 163–201, figs. 10; 202–211, fig. 1*).—In these reports (E. S. R., 49, p. 144) the diseases are arranged alphabetically by hosts, except that under the two headings, forest and shade trees and ornamentals, are grouped the fragmentary records obtained relative to diseases of such plants.

"The diseases of outstanding importance as observed in 1921 were the Fusarium soil troubles, the mosaic diseases, apple scab and blotch, cantaloupe and cucumber bacterial wilt, peach bacterial spot, and tomato leaf spot."

In 1922, "the diseases of outstanding economic importance were the Fusarium soil troubles, the mosaic diseases, apple scab, blotch, and rust, cherry

leaf spot, clover powdery mildew, peach bacterial spot and sun scald, potato leaf roll, raspberry anthracnose, and the cereal leaf rusts. Clover powdery mildew attracted the most attention."

Report of division of plant pathology, B. W. Wells, F. A. Wolf, and S. G. Lehman (*North Carolina Sta. Rpt. 1925, pp. 31–34*).—Summary accounts are given of investigations conducted within the year, some of the results of which have been noted (E. S. R., 52, p. 650; 53, p. 746; 54, p. 147) and on page 249.

Considerable attention was given to a study of seed-borne diseases of soy beans and their control. The use of 2-year-old seed was found to reduce the amount of bacterial leaf spot and mildew. Treating seed with formalin, corrosive sublimate solution, and Bayer Dust was without effect in reducing disease, and the formalin treatment injured germination. Corrosive sublimate solution and Bayer Dust stimulated germination, as evidenced by the increased stand of plants.

A study was made of the possible identity of the wilt of cowpeas and a similar disease of soy beans. Plantings of 48 varieties and selections of soy beans on land formerly in soy beans that were badly wilted did not give a single wilted soy bean plant.

Applications of ground limestone were without effect in the control of *Sclerotium rolfsii*, which is said to cause considerable loss to soy beans.

Notes on parasitic fungi in Wisconsin, IX–XI, J. J. Davis (*Wis. Acad. Sci., Arts, and Letters, Trans., 21 (1924), pp. 251–269, 271–286, 287–302e figs. 8*).—A continuation of the contribution previously noted (E. S. R., 49, p. 242) is presented, with an index to the three sections comprising the present notes.

Plant pathology [Trinidad and Tobago], W. G. Freeman (*Trinidad and Tobago Dept. Agr. Rpt. 1924, pp. 22–24*).—Coconut bud rot proper is not serious if suitably handled and is entirely secondary to the destructive disease or diseases causing heavy losses, located in the stem, perhaps also in the stump, and probably due to species of Phytophthora. Coconut red ring disease, though incurable when once started, is controllable by the eradication measures known. Little leaf disease is common, though sporadic. Milk of lime, properly made from good burnt lime, is as effective as any other remedy if soaked into the heart and repeated where necessary.

Sugar cane mosaic, though suppressed to comparative harmlessness, is probably extending slowly to a degree likely to require eventually concerted general measures. Lime blossom blight involving withertip has been found to be resisted by *Citrus aurantifolia*.

Cacao has pod rot as its most serious disease, years of heavy rainfall, as 1924, causing loss of a large proportion of the main setting. The best preventives are sunshine and drainage. Canker is not a debility disease but requires direct treatment. Rosellinia root disease requires prompt and vigorous control measures.

Coffee Omphalia disease attracted attention during the year.

Diseases of cultivated plants in British Columbia, and their control, J. W. Eastham (*Brit. Columbia Dept. Agr. Bul. 68, 2. ed. (1924), pp. 1–57, figs. 26*).—This is a practical summary of information on diseases of cultivated plants and their control in British Columbia. An account of Sprays and Spraying, by B. Hoy (pp. 98–109), is included.

Mycological investigations [Cheshunt] (*Expt. and Research Sta., Cheshunt, Herts, Ann. Rpt., 9 (1923), pp. 66–69*).—During the year mosaic of cucumber and of tomato constituted the main problem for investigation. Diseases not previously reported include aster damping off (*Rhizoctonia solani*), carnation

wilt (*Fusarium* sp.), chrysanthemum crown gall (*Bacillus tumefaciens*), cucumber chlorosis (cause unknown) and leaf blotch (*Cercospora melonis*), health wilt (fungus not identified), and violet leaf mold (*Cladosporium* sp.).

[Report of] plant disease section, A. Hernandez (*Philippine Bur. Agr. Ann. Rpt., 23 (1923), pp. 159–172*).—In this portion of the report of the director of agriculture an account is given of the work of the plant diseases laboratory as carried on after this was made, under N. G. Teodoro, a distinct section of the plant pests control division.

Banana wilt was reported in the Philippines for the first time in 1920. It attacks the Latundan variety (*Musa sapientum*), the most popular variety in central Luzon. Resistance is shown by the Saba variety or by the Chinese banana (*M. cavendishii*). Attack ends always in the death of the stool. Lacatan, Bongulan, Ternate, Morado, and Saba have not shown susceptibility even though surrounded by the disease.

Abaca heart rot has been produced in typical form by inoculation with *Fusarium cubense*, the cause of banana wilt, which shows, however, an entirely different set of symptoms. Abaca root rot or bunchy top, discovered in Silang, Cavite, in 1920, was associated with a Pythium, a Sphaeronema, four species of Fusarium, and the root-gall nematode, *Heterodera radicicola*. Commercial fertilizers are recommended as supporting resistance. A deterioration of abaca fiber (manila hemp) is ascribed to *Aspergillus niger*, *Aspergillus* sp., and a sterile fungus.

A stem rot of rice from Tarlac Province showed *Sclerotium oryzae*. Undetermined as to distribution, it causes locally a loss of from 30 to 80 per cent.

A sugar cane leaf reddening and drying disease, which is serious at several places named, is being studied as to causation and resistant varieties. Sugar cane mosaic is rare. Sugar cane roots are parasitized by *Aeginetia indica*. Sugar cane smut data are detailed. Red vascular bundle disease studies yielded uniformly an organism believed to be *Bacterium vascularum*. Isolations were also obtained from diseased sugar cane by Medalla of organisms causing root rot (*Colletotrichum falcatum*), ring spot (*Leptosphaeria sacchari*), sclerotial disease (*S. rolfsii*), pineapple disease (*Thielaviopsis paradoxa*), Helminthosporium spot (*H. sacchari*), and lipa leaf spot (organism not yet known).

An adequate disease and pest survey is recommended.

Report on the mycological section for the year ending 31st March, 1924, R. H. Bunting (*Gold Coast Agr. Dept. Rpt. 1923–24, pp. 32, 33*).—Cacao collar crack, reported from localities in Eastern Akim and from Akrokerri, Ashanti, is found to be due to *Armillaria mellea*, which in other parts of tropical Africa is reported to kill coffee, tea, Para and Ceara rubber, mango, guava, Ficus, Eucalyptus, Spathodea, Bauhinia, Erythrina, Hibiscus, and roses, as well as deciduous and coniferous trees in Europe, America, and Australia. Coconut seedling bud rot may be due to storage conditions or to physiological causes. Rice blast (*Piricularia grisea*) was not so serious as during the previous year. Oil palm wilt appears to be attributable to physiological causation in connection with adverse climatic conditions. The fungus causing cacao mealy pod disease, as well as Liberian coffee berry losses, was found also infecting green shoots of Liberian coffee, and found also on wounded fruit of *Persea gratissima*. Molds on dried cacao beans were further studied. Tobacco damping-off was investigated, and the causal organism (*Pythium aphanidermatum*) was isolated. *Colletotrichum* spp. on immature, withered cacao pods was studied. Soy bean nodule examinations were continued.

Report of the mycological division, R. H. Bunting (*Gold Coast Agr. Dept. Rp. 1924–25, pp. 32–34*).—The cacao collar crack fungus (*Armillaria mellea*)

was found on roots of lakpa trees, on moribund lime trees, and on cassava, also on dead roots of ewu and of silk-cotton trees. Transmission of infection has been noted. A cacao tree in Ashanti also showed the usual radial fissures in the wood, and another showed extensive teratoid hyperplasia, supposedly due to *Bacterium tumefaciens*. Algal red rust die-back (*Cephaleuros mycoidea*), on weak plants only, was reported.

Maize smut (*Ustilago zeae*) was spreading in areas named. Maize dry-rot (*Diplodia macrospora*) was the other most serious maize disease, but black spot (*Physoderma zeae maydis*) was severe in some districts. Leaf blight (*Helminthosporium turcicum*) was widely distributed and severe. A maize leaf spot (*Helminthosporium* sp.) is noted, and snail transmission is suggested.

Millet was affected by a grain smut (*Sphacelotheca sorghi*), also by a red leaf spot (*Colletotrichum graminicolum*). The first case was recorded of bulrush millet smut (*Tolyposporium penicillariae*), though it is mentioned as known for many years. Bulrush millet at Aburi was heavily infected on leaves and stalks with *Puccinia penniseti*. This parasite has not been reported previously, except from India and East Africa.

Maize leaves showed *P. maydis*. Sugar cane leaf ring spot (*Leptosphaeria sacchari*) was found near Aburi. Oil palm showed *Thielaviopsis* sp. (*T. paradoxa* ?) and *Ganoderma lucidum*. A *Mimusops elengi* fruit rot was caused by *Phytophthora* sp., not *P. faberi*. This tree showed also a fungus provisionally determined as *Cephalosporium acremonium*. An attack on the troublesome weed lalang (*Imperata arundinacea*) was lessened by *Darluca filum*. *Uredo ochracea* was found on leaves of *Commelina* sp. *Pennisetum setosum* was attacked by *Cerebella cenchroidis*.

Control of plant pests and diseases, H. WOLFE (*Tanganyika Ter. Dept. Agr. Rpt.* [*1923–24*], *pp. 20, 21*).—Cotton yellow stain (internal boll disease), now fairly widespread in Tanganyika Territory, is due, on the side of infection, to a fungus, probably *Eremothecium* sp., introduced by a so-called stainer bug. Favoring conditions include dull weather and damp conditions inside the boll, causing it to open slowly.

Peanut rosette or leaf curl caused great damage in the Mwanza, Tabora, and Lindi districts, and elsewhere. The cause is not known, but it is thought to be a virus disease allied to those of potato or tomato. *Cercospora personata* (*Septogloeum arachidis*) spots the leaves. Importation of seed and use of rapidly maturing varieties are recommended.

Report on the Imperial Mycological Conference, 1924, BUXTON (*London: Colonial Off., 1924, pp. 22*).—The chairman presents a report of the activities of this conference, which was held in London, July 2–5, 1924. Topics discussed included the coordination of investigations of fungicides, plant disease surveys in the British Empire, the standardization of popular and scientific nomenclature in plant pathology, the encouragement of industrial enterprise in the investigation of plant diseases, diseases of tropical plantation crops, the influence of soil conditions on plant diseases, and the application of the results of mycological investigation.

Some of the Diplodias found in southern India, S. SUNDARARAMAN and K. M. THOMAS (*Madras Agr. Dept. Yearbook 1923, pp. 32–38*).—An account, briefly descriptive, is given of Diplodias found on *Bursera delpechiana*, *Theobroma cacao*, *Hevea brasiliensis*, areca palm, *Ficus benjamina*, *Camellia* (*Thea*) sp., *Moringa pterygosperma*, *Citrus* sp., *Erythrina lithosperma*, *Saccharum officinarum*, *Opuntia dillenii*, *Anona squamosa*, and *Cocos nucifera*.

Studies on Nectria coccinea and N. galligena [trans. title], J. WESTERDIJK and A. VAN LUIJK (*Meded. Phytopath. Lab. "Willie Commelin Scholten," No. 6*

(*1924*), *pp. 5–30, figs. 9*).—*N. coccinea* and *N. galligena* are separable on the basis of spore measurements, the characters of the perithecia and conidia being variable. *N. galligena* is found principally on Pomaceae, but also on Fagus and on Salix, causing cankers on both. *N. coccinea* is found on numerous non-pomaceous foliage trees, but it can be induced to cause apple cankers, and it may cause spots on dead bark. Beech canker may be caused by both of these fungi, and poplar canker by *N. coccinea*. No biological-morphological races are known.

The cytology and physiology of Venturia inequalis (Cooke) Winter, C. N. Frey (*Wis. Acad. Sci., Arts, and Letters, Trans., 21* (*1924*), *pp. 303–343, figs. 25*).—In extended bibliographical and investigational detail the author has followed out phases of the cytology and physiology of *V. inaequalis*, indicating the present needs and limitations of such research.

Notes on greenhouse culture methods used in rust investigations, E. B. Mains (*Ind. Acad. Sci. Proc., 39* (*1923*), *pp. 241–257, figs. 5*).—This paper has been written primarily with the object of describing such modifications of methods as have become necessary for the detailed, intensive, and refined studies of rust production in connection with specialized strains and physiological relations which have been in progress at the Indiana Experiment Station, cooperating with the Office of Cereal Investigations, Bureau of Plant Industry, U. S. D. A., since 1918.

Dilophospora disease of grains [trans. title], D. Atanasoff (*Tijdschr. Plantenziekten, 30* (*1924*), *No. 9, pp. 145–160, pls. 4*).—Control measures for *D. alopecuri* on cereals, as here discussed, involve treatment also to eliminate the nematode *Tylenchus tritici*, as the fungus does not appear to attack grains except in connection with attack by this nematode.

Tip burn, E. P. Sandsten (*Colorado Sta. Rpt. 1925, pp. 32, 33*).—The author reports having found a relationship of tipburn of lettuce to the water content in the growing plant. The higher percentage of water with its corresponding succulency of plant tissue seems to induce tipburn, while a higher percentage of dry matter and corresponding hardness or solidity of the tissue depresses it.

Onion blight or downy mildew, A. V. Osmun (*Massachusetts Sta. Bul. 227* (*1926*), *pp. 46, 47*).—A description is given of onion blight caused by *Peronospora schleideni*, and measures are suggested for its control. These include burning of onion refuse from the previous crop, avoiding excessive moisture by under draining and clean culture, and spraying with Bordeaux mixture.

Potato diseases [Scotland], G. H. Pethybridge et al. (*Scot. Bd. Agr. Misc. Pub. 5* (*1925*), *pp. 46–64*).—About 20 potato diseases are more or less common in Scotland, prevailing also elsewhere. The present discussion deals with the principal potato diseases in each of the six groups into which these diseases have here been arranged for convenience.

Potato leaf roll and other significant economic factors [trans. title], O. J. Cleveringa (*Tijdschr. Plantenziekten, 30* (*1924*), *No. 2, pp. 17–26*).—Economic phases and factors discussed include potato diseases, with emphasis on leaf roll and mosaic.

Rhizoctonia attack on potato and its control with sublimate [trans. title], J. C. Dorst (*Tijdschr. Plantenziekten, 29* (*1923*), *No. 6, pp. 97–106*).—*R. violacea* attacks potato somewhat rarely, and has, therefore, little economic importance. *R. solani*, however, attacks both older and younger plants, causing considerable economic loss. Rhizoctonia on seed tubers is said to be controllable by timely and proper treatment of the tubers at a temperature not lower than 5° C. with 0.1 per cent corrosive sublimate.

Crown rot of rhubarb, W. A. Millard (*Univ. Leeds and Yorkshire Council Agr. Ed. [Pamphlet] 134 (1924), pp. 28, figs. 6*).—The rhubarb crown rot organism was discovered in 1915, but the original cultures were lost during the war period. The causal agent was afterwards reisolated, studied, and named *Bacterium rhaponticum*.

The infection may occur at the soil level or may creep up through the roots, causing a soft brown rot near the crown and swollen bases of the stalks. Unforced as well as forced roots are susceptible. The disease may be contracted during the first year, becoming evident in the second year. It spreads in the soil in ways which are indicated. No cure appears possible. Soil sterilization with ammonia has been found very effective. No immune varieties are known, but some strains of Victoria may be more resistant than others.

Improving stands of grain sorghums by seed treatments, H. H. Finnell (*Oklahoma Sta. Bul. 159 (1926), pp. 15, figs. 5*).—Following the beneficial effect observed in the germination of wheat treated for the control of stinking smut, the author treated seed of a number of varieties of grain sorghums with formaldehyde, copper carbonate, and Bayer Dust to determine the effects on germination of the seed. It is said that it is difficult to get satisfactory stands of some varieties if they are planted under adverse conditions, and that replanting is often necessary with feterita, Dwarf hegari, Blackhull, White feterita, and Bishop.

All the treatments delayed molding of the seed for several days, and profitable increases of stand were secured by treating the seed with Bayer Dust or with copper carbonate at the rate of 4 oz. per bushel.

The mosaic disease of sugar cane, I–III, J. R. Johnston (*La. Planter, 73 (1924), Nos. 1, pp. 10, 11, fig. 1; 2, pp. 30–32; 3, pp. 49–52*).—On account of the confusion still prevalent as to the nature of sugar cane mosaic and as to its importance in the sugar industry, the author reviews the situation to date, furnishing an extensive bibliography of the subject.

Sugar cane mosaic is fairly well spread over the sugar-growing world. Though some cane varieties, as Badilla, Java 36, and others, show resistance, and Uba thus far appears to be immune to mosaic, the great majority of cane varieties are continually subject to mosaic attack. Resistance differs, due to variations in vigor and to conditions which can not as yet be precisely defined. Artificial treatments do not increase vigor. Canes rarely throw off mosaic, or survive it, without specific management.

Opinion is almost unanimous that the disease can not be cured. It is transmitted by the corn aphid, which has not yet been successfully controlled. Mosaic attacks other plants near infected cane fields. It can be greatly restricted by roguing or kept out by strict use of healthy seed.

Studies about the sugar cane mosaic, R. M. Ramos (*La. Planter, 73 (1924), No. 25, pp. 488, 489, figs. 2*).—A shorter account, in English, is given of studies already noted (E. S. R., 53, p. 249).

A report on the sugar cane mosaic situation in February, 1924, at Soledad, Cuba, E. M. East and W. H. Weston, jr. (*Harvard Inst. Trop. Biol. and Med. Contrib. 1 (1925), pp. [5]+52, pls. 9*).—This paper is a preliminary account of sugar cane mosaic as it appeared in February, 1924, near Cienfuegos, Cuba.

The mosaic of sugar cane at Soledad is the same infectious sugar cane disease of that name occurring widely in other parts of the world, and it shows the essential characters of the whole group of mosaic diseases found on a great variety of plants. The most notable of these characters are, first, mottling with patternless areas of light gray green, and, second, the infectious nature of juice from young growing mottled leaves.

In Cuba, cane mosaic has been reported from one or more localities in each province, and every estate furnishing reliable information reports its presence. It is probably distributed also in unreported parts of Cuba, where it has probably been present for many years. The infectious nature of the so-called virus is accepted. *Aphis maidis* is suspected, on strong circumstantial but not conclusive evidence, to be the active agent bringing about secondary infection on a large scale. The most important source is presumably diseased cane, though wild grass may at times furnish infective material. Probably diseased seed pieces (cuttings) give rise usually to infected shoots, but not always, owing to unfavorable conditions. Flower-seed transmission has not been known. Apparently, conditions conducive to plant growth increase this disease, or at least they seem to favor the insect disseminators.

At Soledad in February infection existed in cane of all ages, high percentages being found in extremely vigorous cane aged about 17 months, and low percentages on cane 5 months old, also on cane 5 years old and older. Mosaic was found on every soil type; some high percentages on bottom lands and low on droughty or poor soils. Soil reaction was not definitely correlated with mosaic.

Many, and at times most, plants appear to throw off the disease after definite infection. Conditions of recovery are not known.

No internode shortening and canker, said to appear in Porto Rico, were known at Soledad, nor did the mosaic appear locally to reduce acre tonnage, juice yield, sugar content, or purity, but the evidence is not claimed as conclusive on these points. As compared with some other plants, sugar cane is resistant, sometimes highly resistant, though probably none is wholly immune. Among the more resistant varieties are Harv. 1306, 1304, and 1196. Uba has been found to show mosaic, though generally accepted as immune. No evidence of any marked tendency toward increase, either in prevalence or destructiveness, has been obtained. It appears rather probable that a state of balance has been reached as to cane toleration and mosaic harmlessness.

Special, thoroughly-rogued seed plats under most favorable conditions are expected to reduce mosaic incidence and to guard against any danger possibly now existing of a general decrease of sugar production values.

The transmission of sugar cane mosaic [trans. title], G. L. Fawcett (*Rev. Indus. y Agr. Tucumán, 13 (1922-23), No. 7-8, pp. 129-131*).—Chiefly, this deals with the activity of *Aphis maidis* in connection with the transmission of sugar cane mosaic.

Sugar cane root diseases [in Porto Rico] [trans. title], M. T. Cook (*Rev. Agr. Puerto Rico, 14 (1925), No. 4, pp. 245, 246*).—Among the more common of the Porto Rico sugar cane root diseases are mentioned *Marasmius sacchari*, *Himantia stellifera*, *Odontia saccharicola*, *Rhizoctonia* sp., and *Pythium* sp. Small importance is attached to the presence of the nematode, *Heterodera radicicola*, and of the slime mold, *Plasmodiophora vascularum*.

Diseases of sugar cane in Tucumán [trans. title], G. L. Fawcett (*Rev. Indus. y Agr. Tucumán, 13 (1922), No. 1-2, pp. 5-46, figs. 21; rev. ed. as Bol. Estac. Expt. Agr. Tucumán, No. 1 (1924), pp. 47, figs. 26*).—Accounts regarding cane diseases locally important include more particularly a discussion of mosaic, also technical descriptions of two fungi considered as new and named, respectively, *Acrostalagmus glaucus* and *A. sacchari*, with partial description also of a Fusarium not specifically named. The second and later of these two accounts embodies results of more recent investigations.

Tobacco diseases observed in 1925, P. J. Anderson and G. P. Clinton (*Connecticut State Sta., Tobacco Substa. Bul. 6 (1926), pp. 66-73, fig. 1*).—

Observations are reported on brown root rot, wildfire, dust, fertilizer, and Paris green burn, *angular leaf spot, hollow stalk, bed rot (damping off)*, oversterilizing the beds, mosaic, frenching, lightning injury, injury from tarvia fumes, curly dwarf, yellowing from fertilizer leaching, and physiological spotting of broadleaf.

Black rootrot and soil reaction, P. J. ANDERSON and M. F. MORGAN (*Connecticut State Sta., Tobacco Substa. Bul. 6 (1926), pp. 59–66, fig. 1*).—The results are given of studies made in 1925 of soil reaction in relation to the occurrence of black root rot of tobacco in 234 samples of soil. Of the samples studied, 176 showed no injury from disease, and all but 4 had a soil reaction of pH 5.95 or lower, while 68 samples showed a reaction of 5.95 or higher. The most severe infection occurred where the reaction was from pH 6.4 upward.

The method for determining the soil reaction is described in detail.

Diseases of fruit in Massachusetts in 1925, W. DORAN (*Massachusetts Sta. Bul. 226 (1926), pp. 15–18*).—Notes are given of diseases of apples, pears, peaches, grapes, raspberries, and strawberries observed in 1925. Spray calendars are suggested for the control of apple diseases, and spray injury is reported following applications during hot weather or the use of the spray gun.

Apple rust and its control, W. A. McCUBBIN (*Penn. Dept. Agr. Bul. 411 (1925), pp. 10, figs. 7*).—A brief account, general and local, of apple rust states that this trouble is very important, as to Pennsylvania, only in the southeastern part.

Apple varieties in other States listed as only moderately susceptible include Ben Davis, Gano, Aikin, and Northwestern Greening, and as resistant Grimes, Duchess, Winesap, Stayman Winesap, Yellow Transparent, Northwestern Greening, Arkansas Black, Black Twig, Maiden Blush, and Baldwin. Avoidance of sources of infection is the only protection available for very susceptible varieties, which include Jonathan, Wealthy, Benoni, Minkler, Rome Beauty, Smith Cider, York Imperial, and Red June.

A bacterial disease of the Wragg cherry, W. G. SACKETT (*Colorado Sta. Rpt. 1925, pp. 17, 18*).—The organism causing the bacterial disease of the Wragg cherry previously reported (E. S. R., 53, p. 146) has been a subject of further study, and it has been named *Phytomonas cerasi wraggi*. It is claimed that damage to the fruit and foliage can be reduced very materially by spraying with Bordeaux mixture or lime sulfur, although there may be an undesirable dwarfing of the fruit due to the spray mixture.

Anthracnose of dewberries and its control, F. A. WOLF and B. O. DODGE (*North Carolina Sta. Bul. 248 (1926), pp. 16, figs. 6*).—A summary is given of available information relative to the anthracnose of dewberries caused by *Plectodiscella veneta*, and suggestions are made of means for its control.

Important diseases and pests of cacao in Java [trans. title], J. J. PAERELS (*Tijdschr. Plantenziekten, 30 (1924), No. 3, pp. 51–61*).—Besides discussion in brief systematic form of injuries due to animal pests, like treatment is given to injuries or losses, meteorological, physiological, phanerogamic, or fungal, as regards agency. Fungi reported include *Corticium salmonicolor, Diplodia cacaoicola, Phytophthora faberi, Nectria* sp., *Stilbella nana, Thyridaria tarda, Fusarium* sp., and *Colletotrichum* sp.

A saccharomycete in date [trans. title], G. RODIO (*Bul. Orto Bot. R. Univ. Napoli, 7 (1924), pp. 1–12, pl. 1*).—In decaying dates an organism was found which on being studied appeared to be a new species and is so described under the name *Zygosaccharomyces cavarae*.

Ustulina vulgaris and U. zonata [trans. title], C. VAN OVEREEM (*Bul. Jard. Bot. Buitenzorg, 3. ser., 6 (1924), No. 2, pp. 256–263*).—This is a comparative

account, largely bibliographical, of *U. vulgaris* and *U. zonata* as to their characters, host relations, and synonymy. See also below.

[Crown disease of tea], C. BERNARD and A. STEINMANN (*Thee (Alg. Proefsta. Thee [Buitenzorg]), 5 (1924), No. 1-2, pp. 21-23, pls. 3*).—Having carried forward studies elaborating points noted in other publications (E. S. R., 43, p. 247; see also above), the authors give in the present article dimensional and other data regarding the cause of a disease near the crown region in tea plants, associated with the fungus *Ustulina maxima* (*U. zonata*).

Epidemic outbreak of the Phytophthora disease of lilacs [trans. title], H. L. G. DE BRUYN (*Tijdschr. Plantenziekten, 30 (1924), No. 7, pp. 113-122, pl. 1*).—*P. syringae*, usually saprophytic in the soil, may attack lilacs under favoring conditions as here outlined.

Ramularia lactea on violet [trans. title], K. VAN KEULEN (*Tijdschr. Plantenziekten, 30 (1924), No. 7, pp. 123, 124*).—*R. lactea* is said to be one of the most dangerous diseases of violet, causing large losses in the culture of *Viola tricolor maxima* in North Holland.

Heart-rot in conifers, M. L. ANDERSON (*Roy. Scot. Arbor. Soc. Trans., 38 (1924), pt. 1, pp. 37-45*).—The author, having collected facts and figures during some years regarding coniferous heart rot (*Fomes annosus*), has previously drawn attention to its prevalence (E. S. R., 49, p. 447). It is probably impracticable to eradicate this disease when once started in a growing wood, preventive measures alone being available. Since heart rot is almost invariably confined to certain types of locality where soil conditions favor the fungi or limit robust growth of certain species in some way, preventive efforts may utilize soil preparation or species selection, or both, the latter being especially important on agricultural or glacial soils. The facts are held to warrant careful investigations, with a view to minimizing the risk of immense waste through absence of soil correction or through mistaken choice of species.

A new disease of the silver firs in Scotland, M. WILSON and J. MACDONALD (*Roy. Scot. Arbor. Soc. Trans., 38 (1924), pt. 2, pp. 114-118, pls. 2*).—One of the most serious diseases in Scotland of the silver fir (*Abies pectinata*) is said to be that caused by *Rehmiellopsis bohemica*, first described in Bohemia by Bubák in 1910 (E. S. R., 23, p. 751). This fungus has spread rapidly, especially over western and southern Scotland, and has been found on *A. nobilis*, *A. pinsapo*, *A. pindrow*, and *A. cephalonica*.

The two types of infection found on diseased leaves, usually on the upper side, appear alike to the unaided eye. Infection by Rehmiellopsis is frequently associated with the presence of Chermes, especially on *A. pectinata*. Rehmiellopsis attack may be confused with a silver fir disease caused by *Cytospora pinastri*, in which, however, the leaves do not shrivel.

In view of the possibility of infection of *A. grandis* (now being extensively grown in Scotland) by Rehmiellopsis and other fungi, it is suggested that this species, where grown, should not be in pure plantations only.

Studies on fusarioses.—II, Fusarium attack on pine [trans. title], T. LINDFORS (*Meddel. Centralanst. Försöksv. Jordbruksområdet [Sweden], No. 238 (1922), pp. 24, pl. 1, figs. 4*).—A continuation of the work previously indicated (E. S. R., 47, p. 647) is reported, including the isolation of several species of Fusarium from *Pinus sylvestris* and also inoculation studies. Infection of seedlings may be due to infected soil. In this case sterilization may be effected by the application of 0.1 per cent formalin for 15 minutes.

The Gloeosporiums of oak and sycamore, II [trans. title], J. WESTERDIJK and A. VAN LUIJK (*Meded. Phytopath. Lab. "Willie Commelin Scholten," No. 6*

(1924), pp. 31–33).—Continuation of studies reported earlier (E. S. R., 45, p. 753), indicating that *Gloeosporium nervisequum* of sycamore is a separate species and that the Gloeosporiums of *Quercus rubra*, *Q. pedunculata*, and *Q. coccinea* are identical, belonging to *G. quercinum*, is reported as dealing mainly with measurements of spores developed on natural substrata. The sycamore Gloeosporium appears to be both biologically and morphologically separate from the forms on oaks, which, though they vary somewhat among themselves, do not form distinct races.

Cytological studies of Taphrina coryli Nishida on Corylus americana, E. M. Martin (*Wis. Acad. Sci., Arts, and Letters, Trans., 21 (1924), pp. 345–356, figs. 39).*—Studies on *T. coryli*, infecting as an intercellular parasite all parts of the leaves and cortex of 1-year-old twigs of *C. americana*, are outlined, with a detailed account of data obtained.

A dieback and bark disease of willows attacking the young twigs, N. L. Alcock (*Roy. Scot. Arbor. Soc. Trans., 38 (1924), pt. 2, pp. 128–130).*—In October, 1924, rods of a willow, supposedly *Salix alba vitellina*, were found to show black stem blotches and extensive die-back, the fungus present being *Fusicladium saliciperdum*, the cause of willow bark scorch on the Continent. This is said to have for its perfect stage *Venturia chlorospora*, but this form has not been seen by the author in Great Britain.

Many other willows are attacked, including, it has been claimed, *S. alba*, *S. aurita*, *S. caprea*, *S. cinerea*, *S. cuspidata*, *S. fragilis*, *S. mollissima*, *S. nigricans*, and *S. pentandra*. It has been noted in Germany, Denmark, and the Netherlands.

The disease is described as noted locally. The ordinary nursery sprays are recommended for trial.

Biological studies on thistle rust [trans. title], C. Ferdinandsen (*Nord. Jordbrugsforsk., 1923, No. 5–8, pp. 475–487, pls. 4).*—On the basis of the experimentation here reported, it is not considered advisable in practice to attempt to combat Canada thistle, *Cirsium arvense* (*Cnicus arvensis*), with thistle rust (*Puccinia suaveolens*).

ECONOMIC ZOOLOGY—ENTOMOLOGY

Twenty-fifth report of the State entomologist of Connecticut, 1925, W. E. Britton (*Connecticut State Sta. Bul. 275 (1926), pp. 211–330, pls. 20, figs. 13).*—In this annual report (E. S. R., 53, p. 450) a brief summary of the entomological features of the year (pp. 219–231) is followed by reports on the inspection of nurseries (pp. 232–244), of imported nursery stock (pp. 244–246), and of apiaries (pp. 246–253). A Report of the Gipsy Moth Work is given by J. T. Ashworth and W. E. Britton (pp. 253–272); and accounts of Further Experiments in Dusting and Spraying Apple Orchards (pp. 272–278), the details of which are summarized in tabular form, and of the Efficiency of Delayed Dormant Applications for the Control of Apple Aphids (pp. 278–280) by M. P. Zappe and E. M. Stoddard. It was found that Sunoco spray oil, 1 part to 20 parts of water, was the most efficient spray used for the control of aphids at the delayed dormant period. Lime sulfur and nicotine was second best, but lime sulfur without nicotine was only a little better than the check trees.

The papers which follow are The Oriental Peach Moth in 1925 (pp. 280–286), The Curculio Problem in Connecticut (pp. 286–291), Tests of Alcohol-Formalin for Control of American Foul Brood in Bees (pp. 291, 292), and The Pear Psylla in Connecticut, *Psylla pyricola* Forster (pp. 292–295), all by P. Garman; Outbreak of Pea Aphid on Alfalfa (pp. 295–298), Injury to Apples by the Red

Banded Leaf-roller and Its Control (pp. 298–301), and The Raspberry Fruit Worm, *Byturus unicolor* Say, Injuring Strawberry Blossoms (p. 302), all by B. H. Walden; The European Corn Borer in Connecticut, *Pyrausta nubilalis* Hubner, by M. P. Zappe (pp. 303–308); and Further Notes on the Asiatic Beetle, *Anomala orientalis* Waterhouse, by W. E. Britton and M. P. Zappe (pp. 309–312). The authors are still of the opinion that *A. orientalis* has an annual generation, though it is evident that some of the grubs do not become mature at the usual time, but continue over into the second season.

Accounts of Tobacco Plants Severely Injured by Wireworms (pp. 312–314) (noted on page 253), Mosquito Control Work in Connecticut, Season of 1925, by R. C. Botsford (pp. 315–321), and Miscellaneous Insect Notes, by M. P. Zappe (pp. 321–327) follow.

[Report of work in entomology and economic zoology at the Minnesota Station] (*Minnesota Sta. Rpt. 1924, pt. 4, pp. 25–29, figs. 2*).—Reporting briefly upon the apple leafhopper on potatoes, it is pointed out that in control work the best results were obtained with liquid Bordeaux mixture with Blackleaf 40 at the rate of 1 to 800. Reference is made to studies of the clear-winged grasshopper (*Camnula pellucida* Scud.), a report of which has been noted (E. S. R., 52, p. 556). As noted on page 254, tear gas, or chloropicrin, mixed with an equal quantity of carbon tetrachloride, is said to be a promising fumigant for the control of household pests. An apparatus designed for its distribution, consisting of a battery of atomizers connected with a tank of air under pressure, is illustrated. Reference is also made to control work with pocket gophers.

The Montana State Board of Entomology, fifth biennial report, 1922–1923, R. A. Cooley (*Mont. State Bd. Ent. Bien. Rpt., 5 (1922–23), pp. 32, figs. 3*).—During the biennium under report, efforts were devoted largely to the eradication work with the spotted fever tick, *Dermacentor venustus* Banks. The occurrence of spotted fever in various counties of the State, year by year from 1914 to 1922, inclusive, is reported upon in tabular form. A brief account is given of W. E. Gettinger, who succumbed as a result of spotted fever contracted while engaged in laboratory investigations of the disease. A Report of Tick Control Operations in the Bitter Root Valley during the Seasons of 1921 and 1922, by R. R. Parker and W. E. Pollinger (pp. 16–29), and a report on The Cultivation of the Organisms of Rocky Mountain Spotted Fever and Typhus in Tissue Cultures, by S. B. Wolback, H. Pinkerton, and M. J. Schlesinger (pp. 29-32), are included.

[Report of the] division of insect and plant disease control, S. B. Fracker (*Wis. Dept. Agr. Bul. 69 (1924), pp. 52–100, figs. 16*).—In this report the State entomologist deals with work in bee disease control, which is under the immediate direction of C. D. Adams, including an account of the distribution of American foulbrood into new areas; nursery inspection work; grasshopper control work, which is carried on by E. L. Chambers; the cranberry insect survey and control service; San Jose scale control; potato dusting and spraying demonstrations, under the direction of Chambers; and protection against new pests.

Seventeenth annual report of the Quebec Society for the Protection of Plants, 1924–1925 (*Quebec Soc. Protect. Plants Ann. Rpt., 17 (1924–25), pp. 89, pls. 7, figs. 5*).—Papers here presented relating to economic entomology include Some New Ventures in Economic Entomology, by J. G. Needham (pp. 9-13); Applied Entomology in Russia, by W. Lochhead (pp. 13-28), including notes on the development of entomology, based on a paper by B. Katkov, entomological stations in Russia, Russian entomology since 1914, and a list of the most important Russian entomological works; Dr. Charles Eusèbe

Dionne, Naturalist, 1845-1925, by A. Dery and S. Matte (pp. 28-31); The Outbreak of the Gipsy Moth in Southern Quebec, by L. S. McLaine (pp. 32-34); The Cranberry Rootworm Beetle (*Rhabdopterus picipes* Oliv.), by C. E. Petch (pp. 37-41); Two Important Insect Enemies of the Maple, by C. B. Hutchings (pp. 42-45), dealing with the sugar-maple borer and the maple leaf cutter (*Paraclementia acerifoliella* Fitch); and Insects of the Season in Southern Quebec for the year 1924, by C. E. Petch and T. Armstrong (pp. 72-77).

The morphology of insect sense organs and the sensory nervous system, R. E. SNODGRASS (*Smithsn. Misc. Collect., 77 (1926), No. 8, pp. 80, figs. 32*).—This anatomical study is considered under the headings of the nervous system of insects, the peripheral endings of the sensory nerves, the general structure and classification of insect sense organs, the hair organs, the campaniform organs, the plate organs, the chordotonal organs, the organ of Johnston, and the eyes. A four-page list of references is included.

The control of squash insects, H. SPENCER and H. J. HENDERSON (*Virginia Truck Sta. Bul. 52 (1925), pp. 399-414, figs. 8*).—In this account the authors deal particularly with the squash borer, the life history and control of which have been given considerable study. Other insects considered, in the order of their appearance in the fields, are springtails (*Sminthurus* sp.), the striped cucumber beetle and *Diabrotica 12-punctata* Fab., squash bug, melon aphid, pickle worm, melon worm, and the squash beetle.

Tobacco insects observed in Connecticut in 1925, W. E. BRITTON and P. J. ANDERSON (*Connecticut State Sta., Tobacco Substa. Bul. 6 (1926), pp. 74-93, figs. 16*).—The authors report that among the chief features during the season of 1925 were the unusually severe outbreak of wireworms, which caused great injury; the prevalence of cutworms; flea beetles; an apparently unusual occurrence of the seedcorn maggot, which is reported to have riddled the stalks of young tobacco plants in the field at Windsor, though it does not cause widespread injury; and a new form of injury caused by the larvae of a crane fly (*Nephrotoma ferruginea* Fab.).

Cyanogas was found to kill wireworms not only when in contact but through several inches of soil. During the danger season most of the wireworms congregate in or very close to the plants, leaving the more distant soil almost uninfested. Although Cyanogas kills tobacco plants when first put near them in the soil, its toxic effects disappear within a few days, and it is safe to set plants there at least within a week or possibly sooner. Cyanogas seems to have no injurious effect on the quality of the cured leaf.

Cutworms were controlled by the use of a poisoned bait consisting of Paris green mixed with some diluent such as bran, hominy feed, or middlings, at the rate of 5 lbs. to 100 lbs., and moistened with about 15 gal. of water sweetened with 6 oranges or lemons and 4 qt. of cheap molasses.

Orchard insect pests of 1925, A. I. BOURNE (*Massachusetts Sta. Bul. 226 (1926), pp. 18-22*).—The occurrence of the more important insects of the year is reported upon.

Fruit fly and other orchard pests in the Stanthorpe District, H. JARVIS (*Queensland Agr. Jour., 25 (1926), No. 1, pp. 10-13*).—A brief account of the occurrence of and work with the Queensland fruit fly, *Chaetodacus tryoni*, Solanum fruit fly (*C. tryoni solani*), woolly aphid, and woolly aphid parasite (*Aphelinus mali* Hald.).

Control of insect pests in stored grain, E. A. BACK and R. T. COTTON (*U. S. Dept. Agr., Farmers' Bul. 1483 (1926), pp. II+30, figs. 33*).—This is a practical account of the methods employed in combating stored grain insects

by the use of carbon disulfide, ethyl acetate-carbon tetrachloride mixture, and carbon tetrachloride alone.

Chlorpicrin: New fumigant for mill and household insects, A. L. Strand (*Minn. Univ. Agr. Ext. Spec. Bul. 102 (1926), pp. 19, figs. 7*).—In this practical summary of information the three parts deal with the use of chloropicrin (1) for fumigating flour and cereal mills, (2) for fumigating upholstered furniture, and (3) as a general household fumigant. The author points out that in flour and cereal mills chloropicrin is a very effective fumigant against localized infestations of insect pests. It can be used inside such milling machinery as elevator legs, grinding rolls, purifiers, certain kinds of dusters, bins, and tanks.

Some results from spraying with Scalecide, A. I. Bourne (*Massachusetts Sta. Bul. 226 (1926), pp. 39, 40*).—Applied as dormant sprays in the spring against the overwintering eggs of the European red mite, Dormoil gave 99 per cent, Scalecide 98 to 99, Sunoco 97, Rex oil emulsion 89, and 2 per cent lubricating oil emulsion 90 per cent control. In every test Scalecide gave nearly perfect control of the eggs of this pest when applied as a dormant or delayed dormant spray in the spring, and, while not yielding such striking results, it caused a very substantial reduction in the hatch of overwintering egg masses of the apple tent caterpillar. Results to date have indicated a very definite reduction in the numbers of plant lice from a spring application of Scalecide. A very material check upon the infestation of pear psylla was obtained, in one season the reduction amounting to over 90 per cent, and in a weather more favorable to the insect a control of better than 85 per cent was obtained. Scalecide diluted 1 to 20 applied in the spring on a small planting of ornamental spruce gave very satisfactory control of the overwintering stages of the spruce gall louse and no injury to the trees. Tests with the oyster-shell scale yielded negative results. In the three seasons' work with Scalecide, during which it was applied to several varieties of apple, pear, cherry, plum, and peach, covering over 200 trees, there was discovered no instance of injury which was in any way attributable to the spray.

Calcium cyanide as a fumigant for ornamental greenhouse plants, C. A. Weigel (*U. S. Dept. Agr., Dept. Circ. 380 (1926), pp. 16, figs. 9*).—This is a practical account, giving directions for the use of calcium cyanide in combating the insect enemies of greenhouse plants.

A study of the life history and control of the onion thrips, A. I. Bourne (*Massachusetts Sta. Bul. 227 (1926), pp. 48–51*).—Studies of onion thrips have shown that the chief source of thrips infestation of seed onions is from nearby fields of set onions, the greatest movement of thrips taking place at the time the sets mature and are pulled. This coincides with the period of greatest reproductive activity on the part of the thrips, and comes in late July and early August.

Neither nicotine nor the newer calcium cyanide dusts give satisfactory control from the standpoint of cost and of effectiveness, although the latter show considerable promise. The usual type of spray nozzles proving unsatisfactory, a nozzle delivering a flat spray was developed, which delivers the spray at a pressure of from 125 to 150 lbs., causing it to penetrate the axils of the leaves, where the greatest number of thrips congregate. Nicotine sulfate, 1–1,500, with 3 to 4 lbs. of Good's No. 3 Potash Fish-oil Soap added to every 50 gal., was found to give satisfactory control. A second spray application, seven or eight days after the first, has been found advisable to control the larvae hatched from eggs laid in the tissues of the plant.

Tests of lime-sulfur solution and some of its substitutes against San José scale, A. I. Bourne (*Massachusetts Sta. Bul. 226 (1926), pp. 36–39*).—

In experiments conducted none of the dry sulfides equaled the concentrated lime-sulfur solution 1–8 or even 1–12 in killing the scale. Great concentration of the dry materials was found impractical from the standpoint not only of cost, but also of application, owing to the large amount of insoluble matter accumulating in the tank. Under Massachusetts conditions, the commercial lime-sulfur solution, if thoroughly applied, may be used at a 1–10 dilution and still maintain its high efficiency against scale.

Poisoned bait for the control of cutworms, H. H. Wedgworth and C. B. Anders (*Mississippi Sta. Circ. 62 (1925), pp. 3; abridged in Bul. 231 (1925), pp. 13, 14*).—In experiments conducted in the Crystal Springs trucking section, where from 75 to 90 per cent losses from cutworms, particularly the dingy cutworm, were sustained, it was found that with cages free of vegetation 88 per cent of the cutworms were killed where poisoned bait was applied broadcast, and 9 per cent died in the checks, probably from injuries obtained in handling. In the cage experiment where young tomato plants were growing, 7 per cent of the plants were cut in the poisoned cages compared with 96.88 per cent cut in the check cages. In a simple field test, wherein poisoned bait was applied in small quantities near each plant and one row left as a check, less than 1 per cent of the plants were cut on the treated rows, compared with 23.65 per cent in the check.

Can we vanquish the codling moth? I–V, [VI], R. H. Smith (*Better Fruit, 20 (1925), No. 6, pp. 5, 6, 15, fig. 1; 20 (1926), Nos. 7, pp. 7, 13, fig. 1; 8, p. 16, fig. 1; 8 [i. e. 9], pp. 7, 22, fig. 1; 9 [i. e. 10], pp. 7, 13, 17, fig. 1; 11, pp. 9, 16, figs. 2*).—In the first article on control work with the codling moth the author reports upon and gives a tabulated summary of the results of experiments in which 25 newly hatched codling moth larvae were placed upon each of 394 apples, the calyx cavities of which were filled with shellac and which were sprayed ideally in the laboratory by means of a small bulb atomizer. He also gives a tabulated summary of moth spray tests in the laboratory orchard extending over a period of four years.

The laboratory tests showed that lead arsenate was relatively ineffective in protecting the apples against the worms, over 30 per cent of the larvae entering the apples from the side unharmed when a concentration of 2 lbs. to 100 gal. of water was used. The mist coverage was decidedly less effective than any other form of coverage, and the film coverage gave scarcely any better protection than the spotted coverages except at concentrations above 4 lbs. to 100 gal. Increasing the concentration of lead arsenate resulted in a decided and consistent decrease of the percentage of larvae that succeeded in entering the apples.

In the second article the efficiency of the calyx spray is discussed. Several different tests were made in which a large number of apple blossoms were sprayed one at a time, just after the petals had fallen, by means of a small bulb atomizer, the tip of which was held 2 in. away and the spray forced directly against the open calyx. The details are given for one test only, in which lead arsenate without spreader was used at the rate of 4 lbs. to 100 gal. Four days later over 4 per cent of the larvae were found to have entered by way of the calyx, and they were alive.

During the late summer (from July 15 through September) the majority of the eggs are laid directly upon the apples, but earlier in the summer, when the first brood of moths are active, most of the eggs are deposited on the leaves. In order to determine the number of worms poisoned on the leaves, the ends of apple branches, about 18 in. long, were cut in June, placed in bottles of water, and immature apples artificially fastened to them. Spray was applied

with an atomizer, in some cases to the leaves and in others to the apples, at the rate of 2 lbs. to 100 gal. of water, and 25 newly hatched larvae were placed on the fourth leaf above the apple on each branch. The results indicate that perhaps as many as half of the larvae hatching on the leaves may never succeed in reaching apples even when no spray is applied, and in the case of sprayed trees equally as many larvae are killed by the spray on the leaves as by the spray on the apples.

The author was forced to the conclusion that the first and second cover sprays, which are applied when the apples are relatively small, are very much more efficient than the late summer sprays. The results of these experiments, like those reported in the first article, seem to show that the lead arsenate spray, if thoroughly applied, is capable of giving only partial control of the codling moth.

In the remaining articles it is pointed out that in the experiments reported upon the larvae were frequently observed to burrow through the thin upper parts of the poison spots. Because there was a definite tendency for the worms to attempt to enter at the edges of the spots, especially at the lower edge where the poison deposit was thickest, a larger percentage became poisoned than otherwise would be expected. It was observed that the thicker the deposits were, the greater the tendency of worms to enter at the edges. It is concluded that the most important reason spreaders have failed to give the improvement in control that was expected is that the film produced was too thin.

In experiments with sprayed apples, calyxes, leaves, and sections of glass, the mist coverage proved much less effective than the coarse, overspray, and film coverages, all of which gave about the same results. The spray should be applied in the form of a fine mist, under high pressure, using sufficient quantity to form large drops on apples and leaves. Overspraying may constitute a waste, but in order to have all parts of a tree covered with large drops, some parts must be oversprayed, and it is better to overspray than to run the risk of leaving some parts untouched or inadequately covered. With the film coverage, the thickness of the film is the limiting factor. Increasing the amount of poison from 2 to 4 lbs., and from 4 to 8 lbs., per 100 gal. of water, in each case resulted in approximately 10 per cent fewer worms entering the apples, but there was an increase in stings of about 6 per cent in each case.

In no case was 100 per cent control of the worms obtained. Even in using lead arsenate at 16 lbs. to 100 gal., over 2 per cent of the worms entered through the film coverage unharmed, and 9 per cent went through the coarse coverage. Worms become poisoned by crawling over sprayed surfaces. Having the leaves and bark thoroughly covered, therefore, especially early in the summer when nearly all the eggs are laid on the leaves, is fully as important, if not more so, than having spray on the apples. Shaking apples lightly immediatly after they had been covered by large drops of spray resulted in about half of the poison running off, and in nearly twice as many worms entering the apples. This suggests that if the spray is applied in windy weather much of its value is lost by drops being shaken off, and also that, if spreader is used and a film formed, the film remains regardless of the wind and shaking of the branches.

The codling moth in Massachusetts, A. I. Bourne (*Massachusetts Sta. Bul. 226 (1926), pp. 33–36*).—The author summarizes observations of the life history of the codling moth made during the years 1923, 1924, and 1925. He points out that each year there have been two widely separated and distinct periods of abundance in the emergence of first brood moths, the first coinciding very

closely with the time of the calyx application. The second peak of abundance, which may contain the greater part of the total emergence, in 1923 and 1924 occurred three or four weeks after the first, and in 1925 within a shorter period owing to extremely hot weather early in June. The main damage caused by the pest at the present time appears to be largely due to this irregularity in the emergence of moths and consequent long-drawn out appearance of first-brood larvae. It causes the early side worm injury, which has been so prevalent in late years.

For successful control a thorough application of the calyx spray was found essential, upon it depending freedom from blossom-end injury and the lessening of the danger of a large second brood. The cover or post-calyx spray was found almost equally important as it protects the orchards over the long period during which larvae are appearing and prevents early side worm injury. While the exact dates and numbers of applications are governed largely by weather conditions, two applications at intervals of two weeks after the calyx spray or three when the season was unusually early gave excellent results. When the season is early there is usually a large second brood (the bulk of which apparently comes about August 1 each year), and then a special application in early August is necessary to avoid serious late side worm injury.

Codling moth investigations in Virginia, W. S. Hough, L. A. Stearns, C. R. Willey, and L. R. Cagle (*Virginia Sta. Bul. 248 (1926), pp. 27, figs. 9*).—This is a report upon investigations made at Leesburg, Blacksburg, Salem, and Winchester from 1921 to 1925. Much of the data are presented in tabular and chart form. At Salem, in southern Virginia, the first and second broods of larvae developed from 7 to 10 days earlier than the same broods in northern Virginia, and the third brood may be as much as three weeks or more in advance of the same brood in northern Virginia.

Satisfactory control, with an injury of not over 2 per cent of the fruit, has been obtained each year for the past four years in a number of orchards by using lead arsenate, 3 lbs. in 100 gal., without the addition of a spreader or sticker, in sprays applied in the petal-fall and 4 and 10 weeks sprays. In orchards where the best results were consistently obtained the fruit showed dried spray drops varying from one-twelfth to almost one-fifth of an inch in diameter.

The pink bollworm, with special reference to steps taken by the Department of Agriculture to prevent its establishment in the United States, W. D. Hunter (*U. S. Dept. Agr. Bul. 1397 (1926), pp. 31, figs. 11*).—This bulletin, the manuscript of which was finally revised by the late author on June 22, 1925, supersedes Bulletin 723, previously noted (E. S. R., 39, p. 764).

The pink boll worm (Platyedra gossypiella Saunders), E. Ballard (*Queensland Agr. Jour., 25 (1926), No. 1, pp. 23–30, figs. 6*).—This is a brief summary of information on the pink bollworm. It is pointed out that the pest is present in the dry belt of New Guinea, 50 miles east and west of Port Moresby and in and around Rabaul.

Seasonal variation in pink boll-worm attack on cotton in Egypt in the years 1916–1924, C. B. Williams (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 67 (1926), pp. 12, pls. 3*).—This is a report of observations made weekly on approximately 1,000 bolls picked at random in each of the 14 provinces of Egypt.

Investigations and observations on the web of the Mediterranean flour moth and its construction [trans. title], A. Hase (*Arb. Biol. Reichsanst. Land u. Forstw., 13 (1924), No. 2, pp. 79–128, pls. 10*).—This paper deals with

the spinning apparatus of the caterpillar, the spinning of the cocoon and inclusion of foreign bodies in it, the nature of the silk, etc. A bibliography of 56 titles is included.

What is Oestrus nasalis Linnaeus? J. M. Aldrich (*Insecutor Inscitiae Menstruus, 14 (1926), No. 1-3, pp. 15, 16*).—The author concludes that *Gastrophilus nasalis* is the correct name for the horse bot, rather than *G. veterinus* Clark.

The Colorado potato beetle (Leptinotarsa decemlineata Say) in Canada, A. Gibson, R. P. Gorham, H. F. Hudson, and J. A. Flock (*Canada Dept. Agr. Bul. 52, n. ser. (1925), pp. 30, figs. 2*).—This is an extended account of the occurrence, life history, and bionomics of this pest in Canada, its natural enemies, and means of control.

The green June beetle larva in tobacco plant beds, K. B. McKinney and J. Milam (*U. S. Dept. Agr., Farmers' Bul. 1489 (1926), pp. II+6, figs. 3*).—This gives information on the habits and seasonal history of grubs of the green June beetle, with recommendations for the proper management and treatment of the plant beds.

The cacao beetle, F. W. Urich (*Trinidad and Tobago Dept. Agr. Bul., 21 (1925), No. 1, pp. 36-39, pls. 3*).—An account of the life history and habits of this beetle and its control.

The biology and control of Trogoderma granarium Everts [trans. title], H. Voelkel (*Arb. Biol. Reichsanst. Land u. Forstw., 13 (1924), No. 2, pp. 129-171, pls. 3, figs. 3*).—This is a report of a study made of the grain or malt beetle, *T. granarium* (*khapra*), its biology and control.

Boll weevil control by airplane—Agriculture an attractive field for commercial aviation, R. J. Wilson (*Cong. Rec., 67 (1926), No. 40, pp. 2887, 2888*).—In this account the author deals particularly with the successful application of calcium arsenate in the control of the boll weevil, especially during the season of 1925. The success met with by a commercial dusting corporation during the season of 1924, when about 1,000 acres of cotton near Greenville, Miss., were dusted, led to a large extension the following year. During the season of 1925 this company dusted 50,000 acres of cotton and some 200,000 peach trees. During the latter year a number of pecan groves and sugar cane fields were dusted in several States, the work extending into North Carolina, Georgia, Alabama, Mississippi, Arkansas, and Louisiana. The report of B. R. Coad, of the U. S. D. A. Bureau of Entomology, who supervised the work, showed the operations to have been satisfactory, 98 per cent of the farmers having given their unqualified approval.

In control work with the boll weevil, three applications of calcium arsenate were made by airplane at an expense of $5.50 per acre. This included the insecticide, entomological service, application, and supervision. During the season pilots operating for the company were employed for 900 flying hours and applied 374,000 lbs. of powdered calcium arsenate on cotton, peaches, pecans, and sugar cane with satisfactory results in each instance. The average cost for operation was $75 per hour.

The plantain weevil, F. W. Urich (*Trinidad and Tobago Dept. Agr. Bul., 21 (1925), No. 1, pp. 40-42, pl. 1*).—This is an account of *Cosmopolites sordidus* Germ., officially known in this country as the banana root borer, its host plants, life history, and control in Trinidad and Tobago.

The clover leaf weevil and its control, W. H. Larrimer (*U. S. Dept. Agr., Farmers' Bul. 1484 (1926), pp. [2]+6, figs. 7*).—This is a brief, practical account of an important clover pest.

American foulbrood and its control, G. H. Vansell (*California Sta. Circ. 307 (1926), pp. 12, figs. 10*).—The author calls attention to the importance of

being able to differentiate American from European foulbrood, because the two do not require or respond to the same treatment. All combs, honey, and other material must be removed from the colony, giving the bees a chance to reestablish themselves in the new combs. It is no longer necessary to destroy the infected combs, as they can be economically sterilized with a solution of water, soap, and formalin by methods which are outlined.

The European red mite, C. C. Hamilton (*New Jersey Stas. Circ. 187 (1926), pp. 8*).—The author presents data on the relative value of lubricating oil emulsions and miscible oils in controlling the overwintering eggs of this pest and of the apple aphids, compiled and averaged from the reports of work in the Eastern States, that on apple aphid eggs being taken from the work by Peterson (E. S. R., 45, p. 254). An analysis of the results obtained in the experiments shows that, if thoroughly applied, all of the oil sprays will give a reasonably good kill of European red mite eggs. While the control is essentially the same with miscible oils at the recommended dilution and with lubricating oil emulsion at a dilution of 1 to 33, and both give satisfactory control against the San Jose scale, the former are much cheaper. It is shown that a satisfactory control of apple plant lice can not be obtained with oil sprays or with lime sulfur alone, but that nicotine sulfate must be added if apple aphid eggs are abundant.

ANIMAL PRODUCTION

The mineral content of pastures, W. E. Elliot, J. B. Orr, and T. B. Wood (*Scot. Jour. Agr., 8 (1925), No. 4, pp. 349–359*).—The results of this investigation at the Rowett Research Institute, Scotland, are reported in two parts.

The first part deals with the mineral analysis of 338 hand-plucked samples of pasture plants selected from different areas from typical cultivated and natural Scotch, English, and Welsh pasture and from pasture in the Falkland Islands and Romney Marsh, together with samples taken monthly from May to October to show the seasonal changes in mineral content. The analyses of the pasture plants showed that there was little difference in the energy value of good and poor pasturage, but the percentage of nitrogen and all essential minerals except sodium was less in the natural than in the cultivated pastures. Poor pastures and plants not eaten were especially low in calcium and chlorine. The pastures of the Falkland Islands, where increasing difficulties with mineral deficiencies have been apparent, were very low in calcium, phosphorus, and sodium. Soil analyses indicated that a calcium deficiency in the soil tended to result in a deficiency of the various other minerals, especially phosphorus and chlorine, in the pasture plants, though the latter minerals were prevalent in the soil. Further evidence for this influence was brought out by a marked increase in these elements occurring in pasture plants grown on a field treated with lime and slag, as compared with the plants on an adjoining untreated field.

The second portion of the work gives the results of two feeding experiments with sheep. In the first experiment four groups of four lambs each, averaging from 68 to 75 lbs. in live weight, were fed on oats, linseed cake, distillers' grains, swedes, and hay, with supplements of linseed oil and a calcium salt, cod-liver oil and a calcium salt, or cod-liver oil. All of the lambs in the lot receiving only the basal ration showed signs of calcium deficiency, but there was no evidence of such in the lots receiving the supplements. In a second experiment, which was similarly conducted, lambs receiving the basal ration only and with supplements of 20 cc. of olive oil or 0.5 oz. of sodium chloride showed signs of malnutrition, which were not apparent when supplements of 20 cc. of cod-liver

oil or 0.5 oz. of sodium chloride and 0.5 oz. of calcium chloride were added daily.

The mineral elements in animal nutrition, J. B. Orr (*Jour. Soc. Chem. Indus., 44 (1925), No. 40, pp. 964–970*).—Mainly a discussion of the mineral requirements of livestock, with reference to the sources of minerals and factors favoring mineral assimilation.

[Nutritional factors affecting reproduction], R. H. Ruffner and R. S. Curtis (*North Carolina Sta. Rpt. 1925, pp. 22, 23*).—The results of two experiments, one of which is a continuation of previous work (E. S. R., 53, p. 770), are noted.

Effect of oil extracted peanuts upon reproduction and lactation of small animals.—Rations of cereals alone without fresh cabbage or whole milk have given unsuccessful reproduction, but young were reared through the third generation when 5 per cent of alfalfa meal was included. The ash of the equivalent amount of alfalfa meal did not give the same results, tending to indicate that something in the organic matter is essential. Similar results were obtained when the ash of whole milk or of cabbage was used as a supplement.

Effect of heavy cottonseed meal feeding upon reproduction and lactation of dairy cattle.—In earlier experiments cows receiving rations of cottonseed meal and cottonseed hulls and having access to green feed produced apparently normal calves, but later when no green grass was available the cows produced immature, weak, and blind calves on the same ration.

In later experiments definite supplements to the cottonseed meal and cottonseed hull ration have been studied. Among the supplements which have been tried are crude casein, calcium carbonate, butterfat, steamed bone meal, cod-liver oil, vitamin B, and green alfalfa meal. So far the more complex nutritively balanced rations have given the best results. Beneficial results have followed the addition of vitamins A and B and calcium.

The influence of histamine and tyramine on the nitrogen metabolism in rabbits [trans. title], R. Iwatsuru (*Bul. Soc. Chim. Biol., 7 (1925), No. 8, pp. 946–954*).—In these investigations histamine was found to lower the nitrogen excreted in the urine, while tyramine increased the elimination of urinary nitrogen.

Meat and bone by-products, F. T. Shutt and S. N. Hamilton (*Canada Dept. Agr. Bul. 49, n. ser. (1925), pp. 14*).—This contains definitions and representative analyses of meat meal, meat scrap, digester tankage, meat and bone meal, meat and bone scrap, digester meat and bone tankage, bone meal, blood meal, cracklings, and edible fish meal.

Feeding stuffs, F. T. Shutt (*Canada Expt. Farms, Div. Chem. Rpt. 1924, pp. 27–40*).—This is a report of analyses of various livestock and poultry feeds, including the composition of different varieties of oats and the ingredients found in cattle tonics, condimental feeds, and abortion remedies.

The new status of net energy determinations, E. B. Forbes (*Science, 63 (1926), No. 1629, pp. 311–313*).—A brief account of the revision in technique and methods of computing the net energy values of feeding stuffs at the Pennsylvania Institute of Animal Nutrition, essentially noted from another source (E. S. R., 54, p. 758).

Hides and skins, J. R. Arnold (*Chicago and London: A. W. Shaw Co., 1925, pp. XXIV+606, pls. 17, figs. 17*).—This book deals largely with the commercial phases of hide and skin manufacturing and distribution.

Cattle of the Ardennaise region [trans. title] (*Min. Agr. [Belgium], Serv. Élevage Pub. 6 (1925), pp. 68, pls. 20, fig. 1*).—An account of the breeds of cattle and cattle production in this region.

A progress report covering investigations of cooperative project on the feeding and killing qualities of cattle on the King ranch, J. L. Lush, W. H. Black, and A. T. Semple (*Cattleman, 12 (1925), No. 5, pp. 53–57*).—Results are reported of one year's experiments in fattening steers in a 179-day experiment at a ranch in Texas. The work was conducted under the supervision of the Bureau of Animal Industry, U. S. D. A., and the Texas Experiment Station. All lots of steers were practically the same age, but due to slight differences in the methods of feeding, the Hereford and Hereford-Brahman steers were comparable, and the Shorthorn steers were comparable with the Shorthorn-Brahmans, but the two groups were not comparable with each other.

In the feeding trials all lots received kafir heads, which were later replaced by ear corn, cottonseed meal, silage, and hay, but after the first 120 days the silage was discontinued.

Five steers of each type were slaughtered at the beginning of each experiment for a study of the existing differences. Eight of the best steers in each lot were slaughtered after 120 days and the remainder at the conclusion of the test. A summary of the gains and feed consumed by the different lots is given in the following table:

Summary of gains and feed consumption

Breeds	Number of steers	Average initial weight	Average daily gain		Feed consumed per 100 lbs. of gain						
					First 120 days				Last 59 days		
			First 120 days	Last 59 days	Grain	Cottonseed meal	Silage	Hay	Grain	Cottonseed meal	Hay
		Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
Hereford	25	509	1.69	1.17	618	141	351	165	1,028	203	170
Hereford-Brahman	24	536	1.57	1.50	703	162	389	196	904	179	176
Shorthorn-Brahman	25	588	1.38	1.45	883	203	431	312	1,047	205	230
Shorthorn	25	513	1.68	1.89	648	149	353	201	788	156	150

The dressing percentages based on the selling weights at the Fort Worth market and the warm carcass weights minus 2.5 per cent for chilling were, respectively, for those killed at the beginning of the experiments and after 120 and 179 days of feeding, Herefords 55.7, 57.8, and 57.2 per cent, Hereford-Brahmans 56.3, 59.5, and 59.4, Shorthorn-Brahmans 55.3, 59.2, and 61.4, and Shorthorns 54.3, 55.7, and 56.6 per cent. In addition to the dressing percentages of the animals slaughtered at the different ages, records were also kept of the weights of the various organs and of the proportions of the various cuts from each type.

These results indicated that the Brahman crossbreds showed higher dressing percentages because of a smaller proportion of stomach and intestines and of stomach contents. There was also an indication that the Brahmans have less bone and less fat trimmings and more meat than the Herefords and Shorthorns. Brahmans also have lighter loins and ribs and heavier rounds and chucks.

The effect of short periods of cold storage on beef and mutton, W. M. Clifford (*Biochem. Jour., 19 (1925), No. 6, pp. 998–1003*).—The effect of cold storage on the content of total nitrogen, soluble nitrogen, amino nitrogen, carnosine, and creatine in two samples each of beef and mutton was deter-

mined. Portions of the meat were stored in glass jars to prevent evaporation at 25 and 35° F. for as long as 13 days. Samples were taken for analyses on the day of slaughter and at approximately 3-day intervals thereafter.

In all the four tests, which were conducted in hot weather, it was found that meat stored at 35° F. began to develop a musty odor by the sixth day. The frozen meat was in good condition throughout the frozen period, but ice spicules developed on the sixth day, and there was considerable drip when this meat was thawed out. It is concluded that the changes in meats during the storage periods of 10 to 13 days are physical, since no uniform alterations were apparent in the chemical constituents determined.

Lamb feeding investigations, 1923–24, H. E. Reed and H. W. Marston (*Kansas Sta. Circ. 123 (1926), pp. 6, fig 1*).—Six lots of 25 lambs each, averaging approximately 75 lbs. in weight, were selected for determining the relative value of alfalfa, sweet clover, cowpea, and Sudan grass hays when fed with shelled corn, and the comparative value of threshed kafir and kafir heads when fed with alfalfa for fattening lambs. The feeding period lasted 44 days. The average daily gains and the feed consumed per 100 lbs. of gain by the lots receiving shelled corn with the different roughages were as follows: Alfalfa hay 0.32 lb. gain, consuming 421 lbs. of grain and 457 lbs. of hay; sweet clover 0.33 lb. gain, consuming 406 lbs. of grain and 441 lbs. of hay; Sudan grass 0.25 lb. gain, consuming 544 lbs. of grain and 590 lbs. of hay; and cowpea hay 0.30 lb. gain, consuming 446 lbs. of grain and 484 lbs. of hay. The lot receiving the threshed kafir made an average daily gain of 0.32 lb. and consumed 419 lbs. of grain and 455 lbs. of hay per 100 lbs. of gain, while the lot receiving kafir heads made an average daily gain of 0.33 lb., consuming 657 lbs. of kafir heads and 439 lbs. of hay.

The lambs receiving the shelled corn and alfalfa hay were the best finished of any of the lots and, consequently, yielded the best returns. Kafir heads and alfalfa and corn and sweet clover followed closely in the order of efficiency. Sudan grass hay proved unsatisfactory.

Soybean hay for fattening lambs, J. M. Evvard, C. C. Culbertson, W. E. Hammond, and K. K. Henness (*Iowa Sta. Bul. 234 (1926), pp. 155–183, figs. 3*).—In a study of the relative values of red-clover hay and soy-bean hay for fattening lambs, 5 lots of 30 head each, averaging about 55 lbs. in live weight, were selected and fed for 66.5 days. All lots were full fed shelled corn, corn silage, and block salt, and received 0.15 lb. of cottonseed meal per head daily. The roughage in lot 1 consisted of red clover hay, in lots 2 and 3 whole soy-bean hay, and in lots 4 and 5 ground soy-bean hay, and in the latter the ground hay was mixed with the grain as fed. Some trouble was experienced during the experiment with the development of urinary calculi toward the end of the feeding period. This condition was especially bad in the lambs of lot 3. The average daily gains made in the different lots 1 to 5, given in consecutive order, were respectively: 0.468, 0.504, 0.453, 0.510, and 0.474 lb. Grinding the soy-bean hay evidently promoted the gains when the hay was not mixed with grain. Attention is called to the difference in the rate of gain of lots 2 and 3, both of which were fed alike.

Data on the water consumption of the lambs are presented after the tenth to twentieth and the fortieth to fiftieth days of the experiment.

The effect of the soy-bean hay and red-clover hay on feed consumption showed that considerably less shelled corn and hay were consumed by the lot receiving the whole soy-bean hay than by the lot receiving red clover, but the reverse relation prevailed in the comparison of ground soy-bean hay with red-clover hay. Over 20 per cent of the whole soy-bean hay offered was re-

fused, but there was practically no waste in the red clover lot or in the lots receiving the ground hay.

Data on the feed consumption per unit of gain, shrinkage, dressing percentages, and comparative finish of the different lots are given in the following table:

Gains, shrinkage, and dressing percentage

Lot	Feed consumed per 100 lbs. gain					Chicago selling price	Profit per lamb over estimated feed cost	Shrinkage to market	Dressing percentage
	Shelled corn	Cottonseed meal	Corn silage	Hay	Salt				
	Pounds	*Pounds*	*Pounds*	*Pounds*	*Pounds*			*Per cent*	*Per cent*
1	271.69	31.64	231.05	155.89	3.66	$14.75	$3.75	6.87	46.43
2	248.62	29.55	216.96	180.53	2.67	15.25	4.12	6.11	47.38
3	275.35	32.89	238.20	204.48	3.53	15.00	3.56	7.28	47.05
4	249.31	29.21	217.64	164.15	3.08	14.50	3.54	7.93	46.63
5	269.03	31.40	230.80	174.84	2.69	14.25	3.23	6.44	47.37

The results indicated that whole soy-bean hay had a somewhat higher feeding value than red-clover hay.

[Swine feeding experiments at the North Carolina Station], R. H. Ruffner and R. S. Curtis (*North Carolina Sta. Rpt. 1925, pp. 23–25*).—The results of soft pork investigations and other experiments, part of which have been continued from the preceding year (E. S. R., 53, p. 775), are given.

Results of soft-pork investigations from individual feeding.—Five years' experiments with peanuts have indicated that the condition of the carcasses when slaughtered is directly related to the amount of peanut oil ingested during the fattening period. When hardening feeds were given after the softening on peanuts a harder carcass was produced than when the same relative amounts of the feeds were given along with the peanut feeding. This is explained as due to the more rapid production of fat in the larger hog when the growth rate had decreased. The younger hogs showed a tendency to be softer than the older hogs when both had received similar treatment and feeding.

Value of pasture for swine.—Five lots of 8 pigs each were used for the purpose of comparing dry lot with different methods of pasture feeding. The first year's results indicate that although the pigs receiving a 3 per cent grain ration on pasture required a longer time to reach a finishing weight, the gains were more economical than for those receiving a full ration. Temporary pasture produced somewhat cheaper gains than permanent pasture. Self-feeding on pasture was more expensive than self-feeding in dry lot.

Hogging off corn and soy beans grown together.—Seventy fall pigs, averaging 53 lbs. in live weight, were placed on corn and soy beans grown together, having an estimated yield of 30 bu. of corn and 5 bu. of soy beans per acre. During the 80 days on this feed each acre produced 523 lbs. of pork when supplemented with 113 lbs. of fish meal and 16 lbs. of minerals.

Fish meal v. soy bean meal as protein supplements to corn for fattening pigs.—In two experiments at the Black Land Substation 136 pigs were used for comparing fish meal with soy bean meal as protein supplements to corn when self-fed, free choice in dry lot. The results indicated that more rapid and economical gains followed the feeding of fish meal than the feeding of soy bean meal. Soy bean meal proved to be very palatable but appeared to increase the cost of gain materially because of the excessive amounts consumed.

Oats in the growing and fattening of spring pigs, J. M. Evvard, C. C. Culbertson, W. E. Hammond, and Q. W. Wallace (*Swine World, 13 (1926), No. 6, pp. 20, 21, 94, 98, 99, figs. 2*).—In experiments at the Iowa Experiment Station, various combinations of shelled corn, dry and soaked ground oats, tankage, and minerals were compared when fed to 12 lots of pigs on rape pasture. Two further groups were self-fed in dry lot on corn, ground oats, minerals, and a supplemental protein mixture of 75 per cent tankage, 20 per cent corn oil cake meal, and 5 per cent alfalfa meal. Cut rape was also given to one of the groups fed in dry lot. The results of the experiment are tabulated, showing the gains made and feed consumed by each lot during the 120-day feeding period.

The lot receiving shelled corn, dry ground oats, tankage, and minerals made the most rapid gain of 1.57 lbs. per head daily. A lot receiving the same feeds, except that the ground oats were soaked 24 hours and the tankage was limited to 0.25 lb. per head daily, made an average daily gain of 1.50 lbs. per head. The total feed required per 100 lbs. of gain was 360 lbs. with a ration including soaked oats and 380 lbs. with a ration in which the oats were fed dry. Tankage supplements to the rations of corn and ground oats were instrumental in producing larger gains. Dry ground oats also increased the rate of gain in the corn, tankage, and mineral ration. Both ground oats and tankage tended to reduce the feed requirement per unit of gain. Further results from the experiments indicated that pigs could be carried through the summer in good condition on rape pasture with ground oats and minerals. The value of oats was considered to be only approximately from 65 to 75 per cent that of corn. Soaking the oats reduced the feed requirement slightly but did not seem to be warranted.

Some results of soft-pork investigations, O. G. Hankins and N. R. Ellis (*U. S. Dept. Agr. Bul. 1407 (1926), pp. II+68, figs. 16*).—The results of the cooperative soft-pork investigations conducted jointly by this Department and the Alabama, Arkansas, Georgia, Indiana, Kentucky, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, and Texas Experiment Stations, dealing with the effect of rations of corn with tankage, fish meal, and wheat middlings; peanuts; corn with nonsoftening protein supplements following peanuts; soy beans; corn with tankage following soy beans; soy beans plus a medium ration of shelled corn; rice polish with tankage; various oils added to basal rations; brewers' rice with tankage; and peanut meal with corn on the hardness of the pork produced are summarized. Many of the individual experiments have been noted from the reports of the stations and from other sources.

These investigations have definitely shown that the soft-pork problem is fundamentally a problem in fat metabolism, that soft fat contains a higher percentage of unsaturated fatty acids than hard fat, and that this is mainly caused by the deposition of fats in the animal tissue which closely resemble those in the feed. This source of fat forms a large percentage of the fat deposition on animals receiving feeds having a high fat content. On the other hand, animals fattened on feeds containing small amounts of fat synthesize hard fats from carbohydrates and protein.

The data from the individual experiments with certain feeds conducted at the different stations have been combined and analyzed, especially with reference to the relative hardening and softening properties of the different combinations of feeds, the size of the animals, and the total gains made. From the interpretation of the data conclusions have been presented, giving the quality of fat likely to be produced by hogs of different ages when fed on the various combinations of feeds.

The use of measurements for determining the development of domestic animals.—The growth of horses. II, Half-blood and purebred races [trans. title], E. LETARD (*Rev. Zootech.* [*Paris*], *4* (*1925*), *No. 10, pp. 249–255*).—This is mainly a discussion of the rate of increase in weight and height at various intervals from birth to maturity, including references to the relation of certain other body measurements to height and weight.

Breeds of dogs, S. R. SPEELMAN and J. O. WILLIAMS (*U. S. Dept. Agr., Farmers' Bul. 1491* (*1926*), *pp. II+46, figs. 34*).—Brief accounts of the history and descriptions of the various breeds of dogs.

Poultry management on the farm, L. F. PAYNE (*Kansas Sta. Circ. 122* (*1926*), *pp. 50, figs. 19*).—Recommendations are outlined for the feeding, breeding, and management of fowls of all ages, with special reference to the results of the experiments noted from other sources.

Missouri State Poultry Association Year Book, 1925, T. W. NOLAND (*Mountain Grove: Missouri State Poultry Assoc.,* [*1926*], *pp. 99*).—In addition to the usual material of popular interest presented in this report (E. S. R., 53, p. 669), the results of experiments dealing with the effect of confinement, cod-liver oil, etc., on laying hens for the period January 1 to May 20, 1925, when the test was discontinued, are given. The birds kept confined for 16 months were light in weight, their combs were pale and shriveled, egg production was only 12.5 per cent, and hatchability 10.6 per cent. The egg production and hatchability in the lot receiving cod-liver oil were, respectively, 37.3 and 45.8, and in the lot receiving the run of the yard 45.8 and 37.1.

In another experiment lasting from October 1 to May 20, 4 lots of birds were given the same rations with variation in the sonrces of protein. The production in percentage and the hatchability of the eggs on the different rations dnring the period were 20 per cent soy beans 17.5 and 26.4, 20 per cent soy beans plus rock phosphate 9.5 and 38.4, 12 per cent soy beans plus 8 per cent meat scrap 21.3 and 26.1, and 15 per cent meat scrap 20 and 19.5.

[Experiments with poultry at the North Carolina Station], B. F. KAUPP (*North Carolina Sta. Rpt. 1925, pp. 26–28*).—The results of several experiments are hriefly reported, some of which are continuations or repetitions of experiments previously noted (E. S. R., 53, p. 779).

Relation of physical characters to egg production.—In this experiment, designed to develop high quality egg and meat production strains in Rhode Island Reds, Barred Plymouth Rocks, and White Wyandottes, the average egg production has been increased from 72 eggs per year to above 150, some of the hens producing close to 300 eggs per year.

Fish meal v. meat meal for egg production.—Fish meal and meat meal were found to be practically equal pound for pound on a protein basis as sources of protein for egg production in Rhode Island Reds in a 12-month test.

Effects of increasing the feeding hours by the use of artificial light.—Two 3-year periods, in which hens have been subjected to 36 consecutive months of 14 feeding hours per day by the use of artificial lights, have been completed. The results show conclusively that it is unwise to subject hens to the increased length of day for more than 5 months per year.

Comparative value of condensed milk, meat meal, and fish meal for young chicks.—Comparative tests of these sources of protein for young chicks have indicated that the three feeds are practically equal when fed on the basis of their protein content. There were required 3.7 lbs. of meat meal, 2.7 lbs. of condensed buttermilk, 3.8 lbs. of dried buttermilk, and 3.5 lbs. of fish meal, respectively, for each pound of gain.

The effects of direct v. transmitted sunlight upon the health and growth of young chicks.—Chicks receiving transmitted light showed weakened vitality at the end of 5 weeks, while those receiving direct sunlight continued to grow normally.

Poultry feeding studies with milk and meat meal.—In a comparative test of milk and meat meal as a source of protein for laying hens, the milk-fed pullets began laying 17 days earlier than those receiving meat meal. Milk also promoted better growth, and the mortality was less than when meat meal was supplied. It is expected to continue this project for a number of years to estimate the cumulative effects of this type of feeding on successive generations.

Fattening broilers.—The results of several fattening experiments with broilers have indicated that the most economical gains are produced in cool weather, on a ration of ground corn and oats, mixed with milk and fed three times daily. The shrinkage is less when fattened broilers are sold in local markets.

Poultry feeding experiments, W. C. Rugg and W. O. Pederick (*Jour. Dept. Agr. Victoria, 23 (1925), No. 8, pp. 490–498*).—In an experiment at the Werribee Research Farm, 1 lot of 60 Black Orpington pullets was fed for 12 months with wheat, oats, corn, barley, wheat bran, oat bran, barley bran, meat meal, and rape seed meal in separate self-feeders. Another lot of similar birds was given a wet mash, grain, and green feed. The lots receiving the wet mash gained 45.5 lbs. and produced an average of 162 eggs per bird in 12 months, while the self-fed lot gained 40.5 lbs. and produced 172 eggs per bird. The self-fed lot consumed larger amounts of wheat and oats than of any other single feeds.

In another experiment 2 lots of 60 White Leghorn pullets were used for comparing dried milk and meat meal as protein supplements. Both pens were similarly fed except that one received 10 per cent of dried milk in the mash and the other 10 per cent of meat meal. The mash was available at all times. The pen receiving dried milk consumed 430 lbs. more mash than the other lot, but these birds laid an average of 211 eggs each as compared with 175 by the lot receiving mash. The extra feed cost in the milk-fed pen was more than offset by the larger number of eggs produced.

Green feed for poultry, L. G. Schermerhorn (*New Jersey Stas. Hints to Poultrymen, 14 (1926), No. 7, pp. 4, figs. 3*).—This discusses the culture of swiss chard, cabbage, mangels, carrots, and kale, all of which may be used as green feed for poultry. Simple methods of storing roots and cabbage are also described.

Special crate fattening of poultry, M. Decker (*New Jersey Stas. Hints to Poultrymen, 14 (1926), No. 8, pp. 4, fig. 1*).—Popular directions are given for the crate fattening of poultry, including suggestions for the disposal of birds after fattening.

The selection and breeding of laying hens (*North. Ireland Min. Agr. Leaflet 29 (1926), pp. 8*).—Popular directions for selection in culling.

Ultra-violet light and antirachitic vitamin in the hens' eggs, J. S. Hughes, R. W. Titus, and J. M. Moore (*Science, 62 (1925), No. 1613, pp. 492, 493*).—In continuing the experiments at the Kansas Experiment Station (E. S. R., 53, p. 274), the antirachitic vitamin content of the eggs laid by birds with and without treatment by ultra-violet rays was tested, using growing chicks as the experimental animals. The chicks getting eggs from hens which received direct sunlight developed normally, but chicks getting eggs from hens which had been in the experiment for 6 months without direct sun-

light developed rickets. The eggs from birds exposed to a quartz mercury arc lamp for 30 minutes daily were a better source of the antirachitic factor than eggs laid by birds not exposed to ultra-violet rays, but rickets nevertheless developed in the former group. The hatching percentages of the eggs from hens not exposed to sunlight or ultra-violet light were distinctly lower than in the other lots. These results indicate that the antirachitic vitamin deficiency is one factor causing a lowered hatching percentage in eggs from hens not receiving the ultra-violet light.

Note on the storage of eggs, E. A. Griffiths, D. J. R. de Villiers, and L. Anderson (*Union So. Africa Dept. Agr., Sci. Bul. 41 (1925), pp. 16, pl. 1, figs. 8*).—Experiments have been conducted which have shown that the albumin and yolk of eggs freeze at slightly different temperatures, but that the freezing points of both are very close to 31° F. In further tests in which eggs were supercooled before freezing, one consignment was kept at 27° for 10 days without freezing, but when placed on a platform subject to engine vibration it promptly froze. The proper storage temperature seems to be at approximately 32°. Freezing cracks the shell and changes the composition unless a temperature of 19.5° is employed during the freezing process. The effects of humidity, temperature, and air circulation on the evaporation of eggs and the growth of molds during storage are discussed.

DAIRY FARMING—DAIRYING

An experiment on feeding silage to dairy cows, R. Rae and H. W. Gardner (*Jour. Min. Agr. [Gt. Brit.], 32 (1925), No. 7, pp. 635–639*).—In the silage feeding experiment reported, the one previously noted from the Hertfordshire Institute of Agriculture has been practically repeated (E. S. R., 52, p. 276).

Two groups of five cows each were fed by the double reversal method. One ration consisted of 42 lbs. of mangels, 14 lbs. of swedes, 25 lbs. of tare, bean, oat, and wheat silage, 14 lbs. of hay, and 4 lbs. of oat straw chaff. The silage in the second ration was increased to 50 lbs., and the mangels and swedes were omitted. The test periods were four weeks in duration.

The results during the first period were slightly in favor of the silage, but in the second period after changing the ration the production of the cows on silage decreased considerably. This was later found due to the fact that a different layer of the silage had been reached, which was inferior. During the second feeding period the cows also failed to consume their allotment of silage.

Recent evolution in milk secretion of Guernsey cattle, J. W. Gowen (*Natl. Acad. Sci. Proc., 11 (1925), No. 11, pp. 696–701, figs. 2*).—A discussion of the evident evolution of Guernsey cattle toward increased milk and fat production, based on data presented (E. S. R., 54, p. 673).

An examination of the errors introduced by the various approximate methods used for estimating the total quantities of milk and butter fat produced during a lactation, E. J. Sheehy (*Roy. Dublin Soc. Sci. Proc., n. ser., 18 (1926), No. 15, pp. 185–194, fig. 1*).—In analyzing the errors of estimates of the annual milk production of dairy cattle based on the weighings of the milk and fat analyses at different intervals, the daily production and fat content of the milk produced by 7 cows at the Ballyhaise Agricultural Experiment Station and by 5 cows at the Albert Agricultural College were taken as a standard for the actual production of these animals. Using the same data, the errors were determined for the annual production recalculated from 1- and 2-day records taken at intervals of 1, 2, 3, 4, 5, and 6 weeks and of two consecu-

tive daily tests taken 4 and 5 times during the lactation. The data are presented for the individual animals in the Ballyhaise herd.

The results showed that the tests made 1 day each week closely approximated the actual production. As the time between tests increased the errors increased. Two-day tests were not as good as 1-day tests made at more frequent intervals. A small number of samples taken during the lactation period may give quite variable results, but the averages closely approximate the actual.

Accuracy of one-day and two-day test, W. E. Petersen (*Jersey Bul. and Dairy World, 44 (1925), No. 46, pp. 2044, 2058, 2059, figs. 2*).—The yearly fat production of 35 Jersey cows tested in 2-day monthly tests has been calculated on the basis of the first day and the 2-day fat percentages.

It was found that 20 showed a smaller production, 2 the same production, and 13 a larger production when calculated on the first day's data as compared with the 2-day test. The maximum variation observed was 3.25 per cent, but 13 of the cows showed less than 1 per cent variation. The amount of such variation appeared to decrease as the yearly production increased. From these data and other similar results obtained, the 1-day test with a preliminary milking is recommended for practical purposes.

The microscope in the dairying industry, R. S. Williams, J. Golding, and E. R. Hiscox (*Jour. Roy. Micros. Soc., 1925, No. 4, pp. 418–422, fig. 1*).—Three short papers deal briefly with the use of a microscope in studies of milk secretion, fat formation, and the bacteriological examination of milk.

The microscopic appearance of market milk and cream, R. S. Breed (*New York State Sta. Tech. Bul. 120 (1926), pp. 3–7, pls. 16*).—An atlas has been prepared of 16 microphotographs of milk and cream of different quality stained with methylene blue. The appearance of normal milk, cream, and skim milk of good quality, milk from animals suffering with mastitis, milk handled in poorly cleaned utensils, improperly cooled milk, and milk pasteurized under not strictly sanitary conditions is represented, and the photographs are discussed.

Non-thermophilic, spore-forming bacteria associated with pasteurizing equipment, A. H. Robertson, M. W. Yale, and R. S. Breed (*New York State Sta. Tech. Bul. 119 (1926), pp. 3–11, pl. 1*).—The discovery of large rod-shaped, spore-forming bacteria in samples of pasteurized milk which did not appear on agar plates or in the raw milk led to an investigation of the organisms of this type. A total of 140 cultures of such organisms were finally isolated from freshly pasteurized milk, or from material scraped from the pasteurizing equipment. Of these cultures 48 were identified as *Bacillus subtilis*, 29 as *B. mesentericus*, 22 as *B. vulgatus*, 21 as *B. circulans*, 10 as *B. albolactis*, 2 as *B. laterosporus*, 1 as *B. panis*, 1 as *B. cereus*, and 1 as *B. mycoides*. Five cultures were not identified.

It is concluded from the study that the presence of such organisms indicates that the pasteurizing equipment has not been properly cleaned. These types do not appear on agar plates because the vegetative cells and a large majority of the spores have been killed by pasteurization.

The technical control of dairy products, T. Mojonnier and H. C. Troy (*Chicago: Mojonnier Bros. Co., 1925, 2. ed., [rev.], pp. XXIX+936, pl. 1, figs. 194*).—A revised edition of the book previously noted (E. S. R., 48, p. 275).

Creamery inspection in New Jersey, G. I. Ball (*New Jersey Stas. Bul. 429 (1926), pp. 15, figs. 4*).—This is the usual report of the creamery inspections in New Jersey for the year ended June 30, 1925 (E. S. R., 55, p. 69).

Variations in cream tests, A. C. Ragsdale (*Missouri Sta. Circ. 146 (1926), pp. 4*).—The chief causes for variations in the fat content of separator cream are pointed out.

The salt content of butter and its influence on quality [trans. title], E. Haglund and E. Waller (*Meddel. Centralanst. Försöksv. Jordbruksområdet [Sweden], No. 290 (1925), pp. 19*).—Analyses of 1,176 casks of butter graded by the Svenska Smörprovningarna indicated that the quality and commerical value of butter were lowered proportionately to the increase in its salt content. In the samples tested the salt content varied from 0.26 to 3.28 per cent and averaged 1.15 per cent. These variations were shown to be due to wide variations in different samples of butter from the same creameries. Twenty-five per cent of the samples averaging 1.89 per cent salt were reported as bitter and coarse in quality. Streaky and brine-yielding butter did not appear to be related to the salt content. Variations in the salt absorbed by butter were observed in tests at the experiment station and at commercial dairies, even though a uniform method of working was employed.

The chemistry of some butter defects, A. L. Gibson (*Sci. Agr., 5 (1924), No. 2, pp. 57–61*).—A study of the chemical changes which are involved in the production of tallowy and fishy flavors in butter.

Effect of pasteurization and cooling of milk upon the quality of Cheddar cheese, J. C. Marquardt and G. J. Hucker (*New York State Sta. Bul. 534 (1926), pp. 3–28*).—A total of 93 samples of milk from 3 different herds were divided into 2 lots when received, and one was held at 70°, while the other was immediately cooled and kept at 40° for 18 hours. Three-pound cheeses were made from the samples. Some were cured at 55°, while others were cured at 70° for comparison. Portions of some samples were pasteurized and compared with the raw milk, while others were frozen for a similar comparison. The scoring of the entire lot of cheese made from milk held at 40° averaged 86.22 per cent, and the scoring for cheese made from milk held at 70° averaged 85.17 per cent, but there was much variation especially in the milk from the different herds with relation to the effect of the holding temperature.

The average score of 24 samples of cheese made from milk kept partially frozen for 18 hours was 83.75, from such milk after pasteurization 85.05, from pasteurized milk previously held at 70° 85.20, and from other portions of raw milk from the same samples held at 70° without pasteurization 82.90 per cent. These results indicate that the freezing of milk did not lower its quality for cheese making, while pasteurization improved the score of the resulting cheese. Pasteurization brought about a greater improvement in the quality of the cheese made from milk containing relatively small amounts of bacteria than in cheese made from milk containing larger numbers.

Cheese made from milk held at 40° scored 3.30 per cent higher when cured at 55° than when cured at 70°. The difference was 2.50 per cent for cheese made from milk held at 70°.

The advantages of milk containing a high butterfat and low bacterial content for the production of high quality Cheddar cheese are noted.

The effect of certain lactic acid producing streptococci upon the flavor of Cheddar cheese, G. J. Hucker and J. C. Marquardt (*New York State Sta. Tech. Bul. 117 (1926), pp. 3–13*).—To study the effect of certain streptococci on the flavor of Cheddar cheese, experimental cheeses, weighing approximately 5 lbs., were made from samples of milk heavily inoculated with milk cultures of *Streptococcus citrovorus*, *S. paracitrovorus*, four strains of *S. lactis*, and with representatives of the acid-liquefying cocci groups, and the flavor was compared with the flavor of cheese made from milk inoculated with a standard starter. In some cases portions of the milk were pasteurized before inoculation.

In studies with *S. paracitrovorus* the slow development of acid was particularly pronounced, but the cheese was better broken down and a more pronounced flavor was apparent in such cheese after three months than in cheese made from milk inoculated with a standard starter. Similar results were obtained with pasteurized milk.

S. citrovorus did not appear to have any influence on the production of flavor in cheese.

Cheese made from milk inoculated with acid proteolytic strains of cocci developed a very disagreeable flavor within 2 or 3 weeks, which was accompanied by a decided breaking down of the curd.

The flavor of all the cheese made from milk inoculated with the different strains of *S. lactis* had an average score of 40.4 per cent as compared with 41.9 per cent, the average score of cheese made with commercial starters. Certain strains produced cheese similar in quality to that made with commercial starters, while other strains produced cheese with very different but characteristic qualities.

When the lactic acid was added to milk in amounts equivalent to that produced by the starter the quality of the resulting cheese was similar in both cases.

The propionic acid fermentation in Emmental cheese produced in Russia [trans. title], A. Voĭtkevich (Wojkewicz) (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 2 (1925), No. 3, pp. 176–185*).—Chemical analyses of types of Russian cheese after from 7 to 8 months ripening have shown the presence of volatile fatty acids and acetic acid, and at certain stages in the splitting of the paracaseins soluble nitrogen, decomposition nitrogen, and the production of volatile fatty acids were observed. A typical propionic acid fermentation was produced by the inoculation of some of the cheese into milk media, propionic and acetic acids being produced in the proportion of 2:1. The number of propionic acid bacteria were not less than 1,000,000 per gram of cheese at the average stage of ripening. Pure cultures of these bacteria resembled *Bacterium acidi propionici* in their morphological and physiological properties. In the fermentation of lactate, the relation of propionic acid to acetic acid production varied from 1.6 to 2 parts of the former to 1 of the latter. In the fermentation of lactose, acetic acid was produced in much greater proportion than was produced by *B. acidi propionici a.* Acidity developed rapidly in inoculated milk, but one of the cultures produced very weak acid.

The author concludes that even though these variations exist, the cause of propionic acid fermentation in Russian Emmental cheese is the same as that in cheese produced in Switzerland.

Using edible gelatine in ice cream, T. B. Downey (*Ice Cream Trade Jour., 21 (1925), No. 11, pp. 81–84, figs. 5*).—The results of tests of the effect of varying amounts and qualities of gelatin on the properties of the resulting ice cream are reported from the Mellon Institute of Industrial Research.

In these tests larger amounts of gelatin having weaker jellying strengths were found to give practically identical results with smaller amounts of gelatin having higher jellying strengths. Improvements in the quality and nutritional value of ice cream containing gelatin were also indicated in experiments with rats.

VETERINARY MEDICINE

Report of the veterinary pathologist [of the Colorado Station], I. E. Newsom (*Colorado Sta. Rpt. 1925, pp. 37–39*).—A brief statement is made of the status of projects under way, including sheep losses in feed lots, con-

tagious abortion, and general disease studies. The work of eradicating contagious abortion from the college herd, which was commenced in May, 1923, has been completed, the last reactor having been detected in December, 1924. In eradicating the disease from the beef herd, 31 per cent of which reacted, 6 tests were made in 13 months. With the dairy herd, 28 per cent of which reacted, 8 tests were made scattered over a period of 19 months. Of 12,464 fowls tested for white diarrhea during the year, 1,352, or 11 per cent, reacted.

The nematode parasites of vertebrates, W. YORKE and P. A. MAPLESTONE (*London: J. & A. Churchill, 1926, pp. XI+536, figs. 307*).—With the main object of simplifying the process of identifying nematode parasites, the authors have confined this work to a description and classification of the genera. Following the description of each genus, however, a list is given of such species, together with their hosts, as can, with a reasonable degree of certainty, be ascribed to it. The subfamilies dealt with are Rhabdiasoidea (pp. 16–20), Trichuroidea (pp. 20–33), Strongyloidea (pp. 33–176), Dioctophymoidea (pp. 176–181), Oxyuroidea (pp. 181–253), Ascaroidea (pp. 254–288), Spiruroidea (pp. 288–387), and Filarioidea (pp. 387–443). Descriptions are given of genera insufficiently known and of uncertain systematic position (pp. 443–449), and collective group names for immature nematodes (p. 449), a glossary and explanatory notes (pp. 450, 451), indexes of generic names and synonyms (pp. 452–467) and of specific names (pp. 468–506), and a list of references (pp. 507–536) are included.

A further survey of the nematode and cestode parasites of sheep, pigs, and cattle in North Wales, October, 1924, to September, 1925, W. N. JONES (*Jour. Helminthol., 4 (1926), No. 1, pp. 36–42*).—This is in continuation of the survey noted on page 274.

Miscellaneous anthelmintic investigations, M. C. HALL and M. WIGDOR (*Jour. Amer. Vet. Med. Assoc., 69 (1926), No. 2, pp. 195–217*).—This is a report of investigations of a number of anthelmintics conducted during 1917 and 1918.

Critical tests of various hydrocarbons showed varying degrees of efficacy in removing ascarids. Tests and published evidence are said to indicate that kamala and male fern are fairly dependable drugs for the removal of tapeworms. Chenopodium, oleoresin of male fern, and kamala removed all the hookworms from one dog, all the ascarids from a second, and failed to remove any tapeworms from the second dog.

"Chenopodium, oleoresin of male fern, and chloroform removed all the ascarids from two infested dogs, 94 and 62 per cent of the hookworms from two infested dogs, 100 and 0 per cent of the tapeworms from two infested dogs, and 10, 0, and 0 per cent of the whipworms from three infested dogs, with another questionable, but indicated failure against whipworms. Since better results can be obtained with other drugs in removing hookworms and tapeworms, and equally good results in removing ascarids, there appears to be nothing to be gained by using this combination. . . .

"The latex of the fig, *Ficus laurifolia*, after shipment to the United States, has not proved a satisfactory anthelmintic; this affords no evidence as to its value in the countries where the tree grows. Pyrethrum does not appear to be of value as an anthelmintic. Betanaphthol is apparently distinctly inferior to carbon tetrachloride and tetrachlorethylene for removing hookworms from dogs. Carbon bisulfid does not appear to be of value as an anthelmintic for dogs.

"One test of chloretone does not show that it has anthelmintic value. While the drug does not promise to be of value in this connection there are theoretical

reasons why it should receive further test in connection with the supposedly anthelmintic value of chlorine in hydrocarbon compounds. Fowler's solution appears to have a very slight anthelmintic value which develops very slowly. It can not be recommended as an anthelmintic. Barium sulfate seems to have no anthelmintic value. Mineral oil in repeated doses has little or no value in removing worms. The cresols have a very slight anthelmintic action in most cases, and act as gastrointestinal irritants to such an extent that their use is not safe."

Studies on anthrax immunity.—II, The immunization of sheep by means of anthrax bacilli attenuated with sodium chloride, S. J. SCHILLING (*Jour. Infect. Diseases, 38 (1926), No. 6, pp. 499–505*).—In this second paper from the Arkansas Experiment Station on the subject (E. S. R., 55, p. 70), the author reports that a single injection of a sodium chloride attenuated culture of *Bacillus anthracis* protected sheep against subsequent infection with a virulent culture. The control animals died in 54 hours of typical anthrax. The immunity conferred by the vaccine was general. Vaccination and subsequent inoculation with virulent cultures were performed subcutaneously but in widely separated sites of administration. Virulent anthrax bacilli may be found at foci of previous infection for some time following the apparent recovery of the infected animal. The reduced pathogenicity as well as the antigenic properties of the sodium chloride attenuated culture of *B. anthracis* appeared to remain fairly constant during cultivation on artificial medium.

The prevention of anthrax among domesticated animals, compiled by E. J. ROVIRA (*La Prévention de l'Infection Charbonneuse parmi les Troupeaux. Rome: Inst. Internatl. Agr., Serv. Sci. Agr., 1925, pp. VIII+155, pls. 4, figs. 10*).—This is a compilation of an international questionnaire on the occurrence of the disease among domestic animals in the various countries, with statistical data and prophylactic and veterinary police measures.

The differentiation and classification of strains of Brucella [trans. title], M. BÉGUET, (*Compt. Rend. Soc. Biol. [Paris], 94 (1926), No. 16, pp. 1187–1189*).—This is a brief report of studies of 42 strains of Brucella obtained from undulating fever, *B. melitensis* affection of the goat, and epizootic abortion in the cow. The author concludes that the morphological, cultural, and serological characteristics are insufficient to differentiate clearly homogeneous groups in the genus Brucella.

A method of increasing the virulence of Clostridium chauvoei by the use of ferric salts, J. P. SCOTT (*Jour. Infect. Diseases, 38 (1926), No. 6, pp. 511–513*).—Experiments by the author at the Kansas Experiment Station with many strains of *C. chauvoei* have shown the difficulty of maintaining their virulence. The addition of ferric sulfate to culture media stimulated these organisms to such an extent that avirulent strains regained their virulence. The virulence of *C. chauvoei* is independent of the fermentative or antigenic properties. The results are thought to confirm the presence of the so-called "lethal substance" or specific cellular activity of virulent cultures of *C. chauvoei* (E. S. R., 53, p. 884).

The rôle of gastric juice in the natural immunity of rabbits to coccidiosis [trans. title], T. A. KOLPAKOFF (*Bul. Soc. Path. Exot., 19 (1926), No. 4, pp. 266–268*).—The author concludes that the gastric juice retards sporogony in *Eimeria stiedae*, and that spore formation does not take place in the pancreatic and intestinal secretions nor in the bile.

[Vaccination experiment with hemorrhagic septicemia aggressin] (*In Missouri State Poultry Association Year Book, 1925. Mountain Grove, Mo., [1926], p. 33*).—A comparison is made of the mortality and incidence of sickness

from certain diseases of birds inoculated with hemorrhagic septicemia aggressin and a mixed bacterin made up of various strains of organisms isolated from cases of roup and cholera. The data are presented in tabular form, and no conclusions are drawn.

The assessment of the infectivity of rabies fixed-virus by means of albino rats, J. W. CORNWALL and W. A. BEER (*Indian Jour. Med. Research, 13 (1926), No. 4, pp. 803–806*).—The authors point out that as different strains of street virus exist and as existing strains of fixed virus do not produce antirabic vaccines potent against all strains of street virus, it is desirable to agree on standard methods of testing (1) the infectivity in subcutaneous injection of any strain of fixed virus and (2) the protective power of a vaccine prepared from any strain of fixed virus against any strain of street virus. Standard methods for these tests are suggested by the authors. When the carbol-vaccine in use at the Pasteur Institute of southern India for antirabic treatment was tested by the standard method on albino rats, it gave an infectivity rate of 14.6 per cent.

Treatment of rinderpest with iodine, S. M. RAZA HUSSAIN (*Indian Vet. Jour., 2 (1925), No. 2, pp. 78–83*).—The author reports that in an outbreak of rinderpest a solution of 20 grains of iodine and 20 grains of potassium iodide dissolved in 4 oz. of water was hypodermically injected into full grown animals and 0.5 to 0.75 of the dose into the younger animals, according to their size and age. A single injection was usually sufficient to effect a cure, but in some cases a second dose after two or three days was administered. None of 46 animals in the first stage of the disease died, and only 1 of 80 cases treated in the second stage and 12 of 51 cases treated in the third stage died. No complications were met with, and the author is convinced that the treatment is very effective and is infallible when administered at the onset of the disease. It is pointed out that the outbreak, though widespread, was mild, the mortality being only from 25 to 30 per cent, and that there has been no chance to test its efficacy during a virulent outbreak. The details of the administration of the iodine in 141 cases in the Lalitpur District of Jhansi Circle and 36 cases in the Jhansi Circle are given in tabular form.

Treatment of rinderpest cases by iodine intravenously, M. K. GARUDACHAR (*Indian Vet. Jour., 2 (1926), No. 4, pp. 258–261*).—Brief reference is made to the iodine treatment that is being followed in rinderpest cases in some parts of India. The results of administration of this treatment subcutaneously by the author are reported in tabular form. A paper on the subject by Raza Hussain is noted above.

North African trypanosomiases [trans. title], J. BAROTTE (*Mem. Soc. Sci. Nat. Maroc, No. 11 (1925), pp. VIII+148+XXIII+149–187, pls. 18*).—This extended account includes a bibliography of 214 titles relating to the subject.

The relative suceptibility of Indian milch cattle of various breeds to tuberculosis, M. B. SOPARKAR (*Indian Jour. Med. Research, 13 (1926), No. 4, pp. 755–780, pl. 1*).—This is a report of tests made of the relative susceptibility to tuberculosis infection of most of the important breeds of cattle in India, the details of which are presented in tabular form.

In the experiments conducted a certain proportion of small Indian calves remained well after inoculation with 50 mg. of bovine culture and when autopsied showed slight or minimal lesions, indicating that they are possessed of a high power of resistance to tuberculosis as compared with English calves, experiments with which were reported upon by the Royal Commission on Tuberculosis (E. S. R., 20, pp. 184, 185). However, a small number of Indian calves in the experiments succumbed to severe generalized infection, and others

that died showed less extensive lesions, so that there appears to be a much wider range of individual variation in susceptibility to tuberculosis infection among the Indian calves than is noted in English cattle, and this appears, within certain limits, to be independent of the size of the animal.

The resistant animals were not restricted to any particular breed or breeds employed, but were present, though not in equal proportions, among most of the breeds tested. The buffaloes seemed to be no more resistant than the cow calves, and, considering that they were somewhat larger animals than many of the latter, they would appear to be somewhat more susceptible to the infection. The European crossbred calves also appeared to possess a high resistance, and in proportionately larger numbers than calves of the indigenous breeds.

Anaplasmosis in cattle (galziete) found to exist in Kansas, P. B. Darlington (*North Amer. Vet., 7 (1926), No. 6, pp. 39–41*).—The author records the occurrence of this disease among cattle in southeastern Kansas and presents notes on preliminary studies.

A preliminary survey of the nematode and cestode parasites of sheep in North Wales, October, 1923, to September, 1924, W. N. Jones (*Jour. Helminthol., 4 (1926), No. 1, pp. 31–35*).—This is a report of a survey made as a result of complaints received from farmers of the presenee of parasitic worms in sheep.

On the Ascaris from sheep, T. Goodey (*Jour. Helminthol., 4 (1926), No. 1, pp. 1–6, figs. 3*).—The author concludes that the *Ascaris* of sheep is the same as *A. lumbricoides*. A list of hosts for this parasite at the present time includes man, chimpanzee, orang-outang, pig, sheep, cattle, and squirrels.

Hog cholera studies, R. A. Whiting (*Jour. Infect. Diseases, 38 (1926), No. 3, pp. 256–261*).—This is a contribution from the Indiana Experiment Station on the transmission of hog cholera and the longevity of the virus in the blood and body excretions.

In exposures to hog cholera made outdoors during the summer seasons, the author found that the disease is easily transmitted over short distances, but not when the distance approximates that of the average width of farm lanes. The author has also observed similar occurrences in field outbreaks. Exposures made indoors during the winter showed that hog cholera can be transmitted consistently across small spaces regardless of ordinary pen partitions and without direct contact, but that such transmissions can be prevented by placing a cheesecloth curtain between the pens.

"Hog cholera virus was viable in closed pens 2 days after the removal of sick and dead cholera hogs. The virus also remained alive in grass yards for 2 days during the month of November and for 1 day during the hot weather of summer. However, in both cases only one of four pigs developed the infection, indicating that pigs may escape picking up infection in large yards. Mixtures of sterile soil with blood, feces, and urine of hogs with cholera were dried at room temperature for 6 days. The blood and soil mixtures remained virulent for 5 days. With possibly one exception, the feces-soil and the urine-soil mixtures were not virulent 24 hours after being removed from the bodies of hogs with cholera. Fresh urine and feces were virulent at different periods after inoculation. There are indications that the feces become virulent before the urine, and that the virulence of the urine persists longer than that of the feces. Pigs developed hog cholera when exposed to dry straw bedding on which blood had been sprinkled 5 days previously. Blood dried from 1 to 15 days at room temperature proved to be virulent when fed or injected. Eye secretions dried under the same conditions were virulent from 1 to 13 days.

In one instance eye secretions proved to be virulent after 15 days of drying. Skin scrapings dried 8 days were also virulent when fed and injected, but did not produce cholera after 9 days of drying."

Contribution to the study of horse sickness in Senegal, L. TEPPAZ (*Contribution à l'Etude de la Horse-Sickness (alias Thypo-malaria des Equidés au Sénégal. Paris: Éditions Médicales, 1925, pp. 43, fig. 1*).—This is a report of investigations commenced in 1909 in the Laboratory of Bacteriology in Senegal and continued and completed in 1921 at the Biological Laboratory of French West Africa.

Canine distemper and its treatment, H. SCHRÖDER (*Die Staupe des Hundes und Ihre Behandlung. Wittenberge, Germany: Bischoff Bros., 1925, pp. 167*).—This is a summary of the present status of knowledge of the disease and means for its control, in connection with a list of 656 references to the literature. Author, medical, and subject indexes are included.

Diseases in poultry (*Rhode Island Sta. Rpt. 1925, pp. 51, 52*).—Brief reference is made to the work with blackhead in turkeys, the mortality from which was 10 per cent during the year. For the first time gapeworms appeared, in one of the control pens. In control work with white diarrhea, chicks fed on cultures of *Bacterium pullorum* were given various chemicals in the drinking water. A hypochlorite solution with about 0.02 per cent available chlorine was the only substance that appeared to have any effect. In the 80 chicks on which this solution was tried, the mortality was only about one-third that of the control lots or the lots given other chemicals. Attempts are being made to transmit paralysis in adult fowls by inoculation.

Obscured reactions in the agglutination test for bacillary white diarrhea, F. P. MATHEWS (*Jour. Immunol., 11 (1926), No. 6, pp. 499–505, fig. 1*).—In work at the Indiana Experiment Station, the author found that the agglutination test for bacillary white diarrhea is frequently obscured by a precipitate, the principal constituent of which is protein. Two cc. of a 2 per cent water solution of sodium hydroxide added to 100 cc. of *Eberthella sanguinaria* antigen did not influence its agglutinability, and eliminated 95 per cent of the "cloudy tests" when added just before setting up the test.

Vaccination against fowl typhoid by the alimentary tract [trans. title], BROCQ-ROUSSEU, TRUCHE, and A. URBAIN (*Compt. Rend. Soc. Biol.* [*Paris*], *91 (1924), No. 34, pp. 1185–1187; abs. in Trop. Vet. Bul., 13 (1925), No. 2, p. 64*).—This is a report of experiments conducted with an emulsion of *Bacterium sanguinarium* (*gallinarum*) killed by an alcohol-ether mixture, 1 cc. of the emulsion representing 1 mg. of dried bacilli. In an experiment six fowls were fed increasing doses of emulsion on successive days and after an interval intravenously inoculated with living cultures. Of these three succumbed and three survived.

Comparative studies on Salmonella gallinarum and Salmonella pullorum, H. G. MAY and K. GOODNER (*Rhode Island Sta. Bul. 204 (1926), pp. 4–29*).—A study of the carbohydrate fermentation of 52 strains of *S. pullorum* and 31 strains of *S. gallinarum* has shown that the members of each group agree very closely in the production of acid from these substances. The authors conclude that in the case of these two species the distinction on the basis of the presence or absence of gas formation is entirely too artificial for separating into two genera organisms that otherwise scarcely show specific distinctions, and they have placed them together in the genus Salmonella.

For the identification of Gram-negative, nonspore-bearing rods from avian sources, the following procedure is followed by the authors: Such organisms are inoculated into media containing dextrose, lactose, saccharose, and dulcitol,

respectively. If the dextrose is fermented with or without gas, but none of the others are fermented, the organism is *S. pullorum*. If both dextrose and dulcitol are fermented but not lactose or saccharose the organism is *S. gallinarum*. The use of the dextrose media is necessary to place the organism in the group. The lactose serves to eliminate coli-like organisms, the saccharose eliminates cholera-like bacteria, while the dulcitol serves to distinguish between *pullorum* and *gallinarum*. Maltose or dextrin might be substituted for dulcitol, but the latter has been found much easier to prepare and to give very reliable results. To reduce the cost dulcitol is used in 0.5 per cent solution in place of 1 per cent. The authors point out that the results of this investigation do not entirely clear up the difference in results obtained with various antigens in the routine test for *pullorum* reactors.

The fact that some antigens will agglutinate in a given serum as much as eight times as well as others explains some of the results, namely, that some antigens will usually detect more reactors than others, but the fact that the weaker agglutinating antigens will in certain flocks detect more reactors than the more readily agglutinated strains still remains unexplained. The titration of antigens from these strains against antisera from eight representative strains of *S. pullorum* and five representative strains of *S. gallinarum* as well as one strain of *Eberthella typhosa* revealed no definite antigenic differences between the two groups of avian pathogens, nor did it reveal any subgroups, with the exception of a slight differentiation within *S. gallinarum*. Since some strains of *S. pullorum* are more readily agglutinated than others it is considered essential to select highly agglutinated strains for the routine test for ovarian infections in adult fowls.

While there is a certain antigenic similarity between these two organisms and *E. typhosa*, the authors show that this relationship is not as remarkable as some investigators have been led to believe.

AGRICULTURAL ENGINEERING

[Agricultural engineering studies at the Colorado Station], R. L. Parshall and G. A. Cumings (*Colorado Sta. Rpt. 1925, pp. 35, 36, 40–42*).—A brief description of investigations on the measurement of irrigation water is presented, which includes data on the development of an improved Venturi flume of small size for field use (E. S. R., 54, p. 280).

Preliminary tests on a double hump hydraulic jump flume with the idea of increasing the degree of submergence before interference with the free flow did not show any marked improvement over the improved Venturi flume.

Investigational work on humidifying air in buildings showed that the relative humidity of inside air was very low, being an average of 15.18 per cent during the winter months and in extreme cases running as low as 8 per cent. The average relative humidity of inside air with an outside air temperature of 0° F. was 12 per cent, and as the outside air temperature increased there was an increase in the relative humidity of inside air due to a greater opening of windows and a greater evaporation of moisture outside. When the temperature of outside air reached 50.68° during the month of April, the average relative humidity of inside air was 19.5 per cent.

The V-shaped humidifier pan, which hangs on the back of steam or hot water radiators and extends into the radiator between the columns, evaporated 2.75 times as much water as similar pans now on the market. It was also found that increasing any dimension of the pan increased the rate of evaporation. The crash-fiber humidifier consisting of strips of crash run-

ning from an upper water pan to a lower water pan, and an electric fan for circulating the air evaporated only a small amount of moisture and showed only negligible increase in the relative humidity of inside air.

The average relative humidity of air during cold weather in a 4-room private dwelling with a water pan in a hot-air pipeless furnace was 32.9 per cent. With a circular V-shaped humidifier pan installed in the hot-air pipe under the register, the relative humidity was 36 per cent. With both pans in operation, the relative humidity was 45 per cent.

Data on the treatment of alkali water for drinking purposes are also included.

[Agricultural engineering studies at the Minnesota Station] (*Minnesota Sta. Rpt. 1924, pt. 4, pp. 5–13, figs. 5*).—Popular discussions are given of some of the experimental work at the station on building materials, profitable farm drainage, the problem of durable draintile, and the cost of clearing land.

With reference to draintile, it is stated that commercial concrete tile are subject to disintegration by the ordinary sulfate salts where found in the soil waters of clay subsoils of the State in quantities exceeding about 0.15 per cent. The severity of the action on concrete of pure solutions of sulfates of magnesium and sodium is somewhat proportional to the strength of the solutions up to 1 per cent. Solutions of from 1 to 9 per cent do not greatly hasten the action.

Laboratory experiments with the newer quick-hardening, high-aluminum cements have indicated that the solution of the problem in the State will probably lie in the general use of some special cement of this type. In addition the resistance of concrete made of Portland cement has in all cases been greatly increased by allowing it to dry and harden in air before exposure to the action of sulfate waters, regardless of how long it has been previously cured in water.

Temperature of water available for industrial use in the United States, W. D. Collins (*U. S. Geol. Survey, Water-Supply Paper 520–F* (*1925*), *pp. II+97–104, pls. 4*).—Data on the temperature of surface and ground waters obtainable at different points in the United States are presented and discussed.

They indicate that the temperature of ground water available for industrial supplies is generally from 2 to 3° F. above the mean annual air temperature if the water is between 30 and 60 ft. below the surface of the ground. At a depth of 10 ft. the temperature may range from 10° above to 10° below the mean annual temperature. An approximate average for the increase in temperature with depth is about 1° for each 64 ft.

The mean monthly temperature of surface water at any place is generally within a few degrees of the mean monthly air temperature when the air temperature is above the freezing point. The maximum water temperature in any of the warmer months is usually from 2 to 6° higher than the mean monthly water temperature.

Some floods in the Rocky Mountain region, R. Follansbee and P. V. Hodges (*U. S. Geol. Survey, Water-Supply Paper 520–G* (*1925*), *pp. II+105–129, pl. 1, figs. 3*).—The results of an investigation of the principal floods in the States in the Rocky Mountain region are presented and discussed, together with data on the areas subject to cloud-burst floods.

Public Roads, [April and May, 1926] (*U. S. Dept. Agr., Public Roads, 7* (*1926*), *Nos. 2, pp. 25–52+[2], figs. 29; 3, pp. 53–68+[2], figs. 20*).—These numbers of this periodical contain the status of Federal-aid highway construction as of March 31 and April 30, 1926, respectively, together with the following articles:

No. 2.—Stresses in Concrete Pavements Computed by Theoretical Analysis, by H. M. Westergaard; Tests of Vibrolithic Concrete, by L. W. Teller and C. E. Proudley; Temperature as a Factor in the Stability of Asphaltic Pavements, by W. J. Emmons and B. A. Anderton; and Motor Vehicle Registrations, Revenue, and Gasoline Taxes for the Year 1925.

No. 3.—Retards in Stream Control, by J. R. Chamberlain; A Study of Unusual Earth Road Conditions in Northeastern Iowa, by Q. C. Ayres; The Value of the Foreman on Fresno and Wheel Scraper Work, by A. P. Anderson; Comparison of Transverse and Compressive Tests of Concrete, by H. F. Clemmer; and Slabs for Delaware River Bridge Tested.

Standards governing plans, specifications, contract forms, and estimates for Federal-aid highway projects (*U. S. Dept. Agr., Misc. Circ. 62 (1926), pp. II+24, figs. 3*).—These standards are outlined as provided in the rules and regulations for carrying out the Federal Highway Act and amendments thereto approved by the Secretary of Agriculture. Standards of practice for plans and specifications adopted by the American Association of State Highway Officials are also included.

Alcohol motor fuel from molasses.—II, Use of alcohol and alcohol-ether mixtures as motor fuels, E. C. Freeland and W. G. Harry (*Indus. and Engin. Chem., 17 (1925), No. 7, pp. 717–720, fig. 1*).—In a second contribution to the subject (E. S. R., 53, p. 790), the methods of securing the best results with alcohol motor fuel under ordinary operating conditions are discussed, and experiments with alcohol and alcohol-ether motor fuels in automobile, tractor, and stationary engines are reported.

It was found that alcohol can be used more successfully in tractors and other engines running at almost constant speeds than in motor car engines. No large admixture of gasoline was necessary for such use. A mixture of alcohol with 0.5 per cent pyridine and 1 per cent gasoline or kerosene was found to give satisfactory results over considerable periods of time in a number of different types of tractors, motor trucks, and stationary engines. In no case was there corrosion of the engine parts, and in all cases the cylinders were especially free from carbon. When first used in tractors the alcohol fuel consumption was about 50 per cent higher than for gasoline or kerosene, but later this figure was decreased by better manipulation until the excess of alcohol over the other fuels amounted to about 33.3 per cent. A slight advance of the ignition proved advantageous, and no device was used for preheating the air.

Tests on the use of alcohol and alcohol denatured with 1 per cent kerosene and 0.5 per cent pyridine in a kerosene-burning stationary engine demonstrated that equal power output can be secured with internal combustion engines using alcohol when operating on a constant full load or high percentage of full load at constant speeds.

The addition of ether to the alcohol was found to improve the fuel considerably for use in automobiles and other engines that operate under variable speed and power conditions. Mixtures of alcohol and ether were found to carburet readily even at low temperatures, and there was no difficulty in starting the engine when cold.

Tests of several mixtures of alcohol and ether to determine the mileages obtained with varying proportions of ether showed a gradual increase in mileage as the proportion of ether was increased. The mileage secured from a given mixture was found to depend largely on the adjustment of the fuel needle valve or the size of jet used. It was found possible to maintain cylinder lubrication when burning alcohol-ether mixtures by adding lubricating oil to the fuel at the rate of about 1 per cent by volume.

Factors influencing carbon formation in automobile engines, J. W. Orelup and O. I. Lee (*Indus. and Engin. Chem., 17 (1925), No. 7, pp. 731–735, figs. 6*).—Tests are reported which showed that the major factors of carbon deposition in an internal combustion engine are the amount of lubricating oil projected into the combustion chamber, the kind of oil used, the temperature of the combuston chamber, and the length of time the preceding factors have been in effect. The first of these is considered to be by far the greatest factor. The data obtained are taken to indicate that the completeness of combustion of the gasoline as such has very little effect in influencing carbon formation. Apparently in carbon removal efforts directed at the influencing of completeness of combustion are misguided except as to the effect of obtaining a higher temperature in the combustion chamber.

Measurement of cup grease consistency by use of the plastometer, P. K. Porter and W. A. Gruse (*Indus. and Engin. Chem., 17 (1925), No. 9, pp. 953–955, figs. 3*).—Studies conducted at the Mellon Institute of Industrial Research on the yield value and mobility of three series of commercial cup greases by the use of a modified Bingham plastometer are reported. A rational comparison of the various grades and makes of cup greases is thus shown. The curves obtained by platting rate of flow against pressure resemble closely those obtained by other investigators for such typically plastic substances as paints.

The data indicate that generally the harder greases with the higher yield values show a smaller tendency to flow or a lower mobility. Greases of the same grade but of different makes were found to vary greatly both in yield value and mobility, and, in fact, showed a variation of physical properties. It is stated that yield value and mobility taken together are related to the lubricating value of the grease only in that they express the characteristics of the grease in a more rational manner than do the methods obtained by the empirical methods of testing so far proposed.

Nebraska tractor tests, 1924 and 1925, E. E. Brackett et al. (*Nebraska Sta. Bul. 212 (1926), pp. 9*).—This bulletin summarizes all the reports of Nebraska official tractor tests for 1924 and 1925 (E. S. R., 52, p. 288).

Uniform-depth press-wheel cotton-planter attachment, W. B. Camp and J. S. Townsend (*U. S. Dept. Agr., Dept. Circ. 381 (1926), pp. 6, figs. 3*).—This device is described and illustrated. The attachments comprise a scraper or lister designed to push away clods and dry surface soil and enable the planting machine to penetrate to a constant depth, a small press wheel operating in the seed furrow just back of the seed spout of the planting machine, a spring controlling the pressure of the press wheel in the seed furrow, two curved knives and scraper arms to cover the seed planted to a constant depth, and a drag chain. The lister attachment consists of a shoe designed to fit over the planter shoe of a standard planting machine, in which the arms and flanges are bent outward and backward at an angle which may vary from 20 to 45° in such a manner that the lower edge will remain approximately parallel to the ground surface.

Cleaning grain with the Bates aspirator, E. N. Bates, G. P. Bodnar, and R. L. Baldwin (*U. S. Dept. Agr., Misc. Circ. 56 (1926), pp. 21, figs. 13*).—Data on the cleaning of grain with the so-called Bates aspirator are presented and discussed in considerable detail. The aspirator is most effective in the removal of light, irregularly-shaped seeds and foreign material. It is least effective in the removal of heavy, smooth, round, or oval-shaped seeds. It is concluded that at its present state of development an average efficiency of about 50 per cent in the removal of average foreign material and dockage may be expected by use of the aspirator.

A general purpose soil auger and its use on the farm, S. W. Cosby (*California Sta. Circ. 306 (1926), pp. 4, figs. 3*).—This auger is described and illustrated, and the details of its use are outlined.

Farm buildings, H. E. Murdock (*Montana Sta. Circ. 131 (1926), pp. 32, figs. 24*).—Practical information is given on the location, arrangement, and construction of farm buildings and working drawings of barns, sheds, and other structures adapted to Montana conditions.

Adobe brick for farm buildings, J. W. Sjogren and J. W. Adams (*Colorado Sta. [Bul.] 308 (1926), pp. 24, figs. 28*).—Practical information on the use of adobe brick for farm buildings is given, together with working drawings for individual structures.

It has been found that soil containing a large amount of clay is essential in good adobe construction. All clay soils do not make good adobe brick, however. The binding material must be added in the form of cut straw or chaff. The soils should be puddled thoroughly and enough water added to make a mud easily handled with a 6-tined fork, and yet stiff enough to retain its shape when the forms are removed. A good molding floor is desirable, and the brick must be properly cured before being placed in a wall. The brick should be protected from moisture and frost while curing. The foundation should extend above the surface of the ground to prevent water from coming in contact with the wall. It has been found that the life of an adobe building may be increased and the appearance improved by the application of a cement stucco.

Cost data for different structures are included.

Practical hog houses, E. Z. Russell (*U. S. Dept. Agr., Farmers' Bul. 1487 (1926), pp. II+14, figs. 9*).—Plans and practical information for the construction of farrowing and shelter houses are presented, revising and superseding Farmers' Bulletin 438 (E. S. R., 25, p. 175).

Methods of dimming lights for poultry houses, H. L. Garver (*Washington Col. Sta. Pop. Bul. 134 (1926), pp. 5–31, figs. 25*).—Methods of dimming poultry house lights now in common use are described and illustrated, together with devices for operating them automatically.

Protecting the farm against fire, M. L. Nichols and T. B. Chambers (*Alabama Sta. Circ. 49 (1926), pp. 14, figs. 6*).—Practical information on the protection of farm buildings against fire, derived mainly from investigational work done on the station farm, is presented. Data on fire-fighting equipment which was tested are also presented, special attention being drawn to the use of pressure water-supply tanks for this purpose. Hose tests indicated that the $\frac{5}{16}$-in. nozzle outfit is the most desirable equipment, since it gives the operator the opportunity of using approximately twice the capacity of the pump for several minutes, or permits the use of a continuous stream at high pressure to protect one building from another.

Comparative efficiency of wire-basket bunkers in refrigerator cars, R. G. Hill, W. S. Graham, R. C. Wright, and G. F. Taylor (*U. S. Dept. Agr. Bul. 1398 (1926), pp. 11, figs. 7*).—Tests of a new type of divided wire-basket bunker, which embraces the features of the United States standard wire-basket bunker but has less ice capacity and increases the meltage surface as the ice melts, are reported. Two tests were made, in which two refrigerator cars were used, one being equipped with the United States standard wire-basket bunker and the other with the divided wire-basket bunker. The car having the divided basket maintained temperatures equal to those maintained by a car of exactly the same construction except that it was equipped with a United States standard wire-basket bunker of larger ice capacity. This car proved to be economical in ice consumption, and the saving in ice was not made at the expense of the cooling efficiency of the car.

Studies on the biology of sewage disposal, W. RUDOLFS ET AL. (*New Jersey Stas. Bul. 427 (1926), pp. 103, figs. 57*).—This is the fourth annual report for the Sewage Substation for the year ended June 30, 1925 (E. S. R., 52, p. 890).

Chemical studies on Imhoff tanks by Rudolfs and F. L. Campbell to acquire a more exact knowledge of sludge digestion under different conditions showed that fluctuations in the carbon dioxide content of gas from one of the tanks were more or less of an oscillatory character. The oscillations themselves were independent of temperature and were correlated in general with the resting and operating periods of the tanks. Shortly after a tank was put out of operation the carbon dioxide content of the gas decreased. The direct relation between ammonia and carbonates produced with the H-ion concentration was very striking. The temperature of the tank contents varied with the seasonal changes, but the changes were very gradual, with an average of 59° F. throughout the year. Gas production and chemical and bacterial analyses showed that the relation between ripe sludge and incoming fresh solids is fairly definite for rapid and efficient digestion. Digestion processes in a storage tank were found to reach an equilibrium rather rapidly after partly digested material was added.

Bacteriological studies on Imhoff tanks by M. Hotchkiss showed that there are various phases in the digestion of material in a tank in which a succession of bacteria take part. The manner of operating tanks influenced the general bacterial flora, and seasonal effects were obscured by short-time variations. The bacterial numbers in a tank, altered and put into operation anew, increased rapidly during the first six weeks, but about five months elapsed before the numbers were comparable to an old tank. The different groups of bacteria showed marked fluctuations, although this was not the case in a tank used for the storage of partly digested material.

Studies by J. B. Lackey on the kinds, distribution, and fluctuations of protozoa in Imhoff tanks indicated that the vertical distribution of ciliates is variable, and that the maximum occurrence of the flagellates is near the point where the slots in the tanks occur. No seasonal fluctuation of protozoa was evident for species, genera, ciliates, or flagellates. There seemed to be a direct relation between chemical end products and animal population present, for when large amounts of carbon dioxide were present large numbers of protozoa occurred. This is thought to explain the fact that protozoa increase with the opening and decrease with the closing of a tank. In five out of six tanks, every time foaming occurred there was a large increase of protozoa. Accumulation of partly digested material resulted in large increases of protozoa. The protozoa were independent of short ranges of pH values above or below 7 in the tanks. Tank protozoa were found to be largely independent of bacteria as a direct source of food. They were found to be either facultative or obligatory anaerobes that may be cultured in the laboratory.

Studies of sprinkling filter beds by Lackey showed that there were surprising fluctuations in the weekly accumulation of film. The texture of the film from tiles left in place for a considerable time was quite different from that from tiles scraped weekly. The older film had an outer layer composed of a zooglea and with a whitish color, which adhered to the thin and crustlike middle layer, forming a substratum for the outer region. The inner layer was black with decayed material. The older film had more varieties of organisms, but apparently only the outer layer was habitable for most of the animals. There was a gradual increase in weight and mass of film after sloughing. There was no great difference between the numbers of animals in the old and

new films. The rate of film deposit was not uniform, and there was an accumulative deposit of inorganic matter as grit in the film. The numbers of living organisms in the film tended to maintain a physiological level. The indications were that sloughing is a seasonal matter, due to changes in the nature of the flora and fauna of the bed. It was found that when fungi attain their largest volume the protozoa are fewest and vice versa.

Studies on fresh solids digestion by Rudolfs, Hotchkiss, A. J. Fischer, and Lackey showed that the general course of digestion in two quantities of fresh solids, one kept under aerobic and the other under anaerobic conditions, seemed similar, but that the type of digestion was different. In the bottle without air, the solid organic materials were transformed to liquid organic materials, like acetic acid, whereas more of the organic material in the bottles with air was gassified. The production of gas was approximately four times larger from the aerobic conditions than from the anaerobic conditions. The rate of digestion was dissimilar with and without air.

Studies on the relation between ripe sludge and fresh solids and the effect of washing on digestion by Rudolfs, H. Heukelekian, P. J. A. Zeller, and Lackey showed that a definite relation must be maintained between sludge and incoming fresh solids. Tanks go bad if this relation is upset by the addition of too much fresh solids. It was found that under favorable conditions ripe sludge can not handle more than 2 per cent fresh solids daily computed on the dry basis. There was a definite relation between numbers of protozoa and certain bacterial decomposition products. These relations appeared to explain why protozoa increase in tanks under certain conditions and emphasized the importance of protozoa on tank behavior. The addition of tap water to the sludge-fresh-solids mixture produced a better-looking sludge, but additions of more than 2 per cent fresh solids impaired the digestion processes.

Studies on the more unusual Imhoff tank gases by Campbell and Rudolfs showed that if hydrogen is formed in the digestion processes it is not found in the gases evolving from the tanks. Hydrogen left in contact with sludge disappeared readily. Practically no hydrogen was absorbed when the sludge was sterilized. Hydrogen sulfide was found in gases from but one tank which was recently altered and put into operation anew.

Rudolfs showed that material stirred every day was not more advanced in digestion than material which had been stirred only twice during the incubation period of two months. The materials stirred once a week seemed to be in the best condition. The results are taken to indicate that no advantage is gained by too frequent stirring.

Preliminary studies on chemical precipitation as an aid to digestion in Imhoff tanks by Fischer led to the conclusion that the addition of an alkali or an alkaline salt will cause the solids to settle to the bottom of the tank, causing digestion to proceed more rapidly. Neutral calcium salts such as calcium chloride will serve the same purpose. It is concluded that lime should prove beneficial provided not too much is added. It appeared that copper sulfate, although of no value for settling solids, may be used to dry greasy scums.

In preliminary studies on partial sterilization by Rudolfs and Heukelekian, copper sulfate and mercuric chloride in concentrations varying from 1:100,000 to 1:1,000,000 depressed the numbers of protozoa and stimulated the numbers of bacteria. Paratoluidine in a concentration of 1:1,000 killed off all protozoa, and in a concentration of 1:10,000 greatly suppressed their numbers. Lime in concentrations of 1:750 and 1:1,000 killed all protozoa within 24 hours. When fresh solids were added, making the mixture less alkaline, the protozoa

were markedly stimulated. Carbon disulfide emulsion in concentrations varying from 1:1,000 to 1:5,000 killed off all protozoa and suppressed their growth for over a month. Even in lower concentrations such as 1:7,500 and 1:10,000 their numbers were greatly reduced. However, in a concentration of 1:15,000 there was a marked stimulation of the numbers of protozoa after one week.

RURAL ECONOMICS AND SOCIOLOGY

[Investigations in] agricultural economics [at the Minnesota Station] (*Minnesota Sta. Rpt. 1924, pt. 4, pp. 19–24, figs. 2*).—Projects representing the work of the year 1924 are discussed, and results are briefly noted.

Movement of spring wheat.—A study of the movement of spring wheat from 1905 to 1924 in Minnesota, Montana, and North and South Dakota, with particular reference to the Minneapolis terminal market indicated that the movement from the farm to the country elevator at any given time has been very largely controlled by the seasonal and immediate weather conditions. Over a relatively longer period the attitude of the farmer and his opinion of the market are the more important factors. The average proportion of the crop moved from the farm by January 1, from 1905 to 1924, was 78 per cent, ranging from 73 in 1910–11 to 83 in 1913–14 and 87 in 1918–19 when high prices and war propaganda were factors. The percentage of the crop stored at country elevators from 1915 to 1924 was over twice, and from 1920 to 1923 over three times that for the period 1905–1914. The rate of movement from the country elevator to the terminal was found to be largely dependent upon that from the farm. Fluctuations in the movement from the terminal market are due to heavy exports or a demand from the mills for a particular grade of wheat.

Land settlement policy.—The conclusions reached from the study of the progress records of 2,000 settlers in Minnesota, Wisconsin, and Michigan made at the station, with the cooperation of the Division of Land Economics of the U. S. Department of Agriculture, are briefly set forth here.

Predicting the general price level.—This study of the factors that cause general price changes and the corresponding changes in the prices of corn, hogs, butter, and other farm products indicates that they can be explained and even predicted with very great accuracy from a study of demand deposits in commercial banks. Two charts are presented here, one of which shows the relationship between the general price level and the demand deposits for the whole United States since 1921. It is held that any control over general price changes must be exercised largely through a control of the national banking system, and that this is now possible through the Federal reserve system.

The law of diminishing returns, E. A. SOUTHEE (*Agr. Gaz. N. S. Wales, 36 (1925), No. 12, pp. 837–848, figs. 9*).—An explanation of John Stuart Mill's law of diminishing returns and its use in determining the most profitable agricultural practices. Several examples and graphs are included to demonstrate the operation of the law and to serve as guides for farmers in its use.

Revised estimates of crop acreages, New York, 1862–1919, D. JACKSON and J. A. BECKER (*U. S. Dept. Agr., Dept. Circ. 373 (1926), pp. 20, figs. 11*).—Consistent methods of arriving at the estimates of crop areas and yields of crops have not always been used by this Department since it began making such estimates in 1862. The Bureau of Agricultural Economics has worked out the following formula for making corrections in the past estimates:

$$C_s=E_s\left(\frac{C_o}{E_o}\right)^{\frac{n-s}{n}}\left(\frac{C_n}{E_n}\right)^{\frac{s}{n}}$$

when C=census or corrected figure; E=estimate by the Department of Agriculture; n=number of relatives within the period, i. e., number of years (including beginning and ending) less one; x=year under consideration (x varies from o to n).

This circular shows by tables and graphs the relation between the old and corrected estimates for field crops in New York and gives step by step the method of making such corrections.

Farm management problems on irrigated farms in hay and potato areas of the Yakima Valley, Washington, E. R. Johnson and S. B. Nuckols (*U. S. Dept. Agr. Bul. 1388 (1926), pp. 64, figs. 19*).—A business analysis of the existing farming is made based on reports from 111 representative farms for the crop year 1921 and 139 farms for the crop year 1922. The farms studied were chiefly on the lower and more level lands, which are used principally for hay, forage, vegetables, and livestock. Based on these reports and other data, the yields, man and horse labor used per acre, seasonal distribution of labor, and other factors in production are determined for the principal crops. The selection and production of livestock and the principles governing the choice of crops and livestock are discussed. A detailed analysis is made of the business and organization of seven farms, and the application of the above principles is discussed for four of these farms.

Factors affecting farmers' earnings in southeastern Pennsylvania, M. Ezekiel (*U. S. Dept. Agr. Bul. 1400 (1926), pp. 64, figs. 11*).—A detailed study based on records collected in 1923 from 422 farms in Chester County, Pa., is made of the methods of organizing and operating farms in the Piedmont Plateau region. The farm organization, factors affecting farmers' earnings, factors affecting returns from dairying, and the place of the mushroom enterprise on dairy farms are discussed, together with the methods used in the bulletin for measuring the charge for the use of land, the factors affecting the earnings on all farms, and the factors affecting the earnings on dairy farms.

Analysis of the management of a cotton-growing enterprise, C. H. Schopmeyer and A. P. Williams (*Fed. Bd. Vocat. Ed. Bul. 105 (1926), pp. 26*).—This bulletin is an analysis of the managerial jobs connected with cotton growing, and is based upon an extensive study of practical operations in Texas, Louisiana, and Mississippi. It is intended for the use of vocational teachers and supervisors in the selection and organization of training content and to illustrate the procedure in analyzing managerial-training content of farm jobs.

The present status of the Connecticut Valley onion industry, L. P. Jefferson (*Massachusetts Sta. Bul. 227 (1926), pp. 43, 44*).—This paper is a summary of information regarding the competition to be met with on the Boston market by Connecticut Valley onions. Statistics of acreage and production, 1921–1925, in Massachusetts and in three States that are chief competitors are tabulated.

The poultry and egg industry in Europe, H. C. Pierce (*U. S. Dept. Agr. Bul. 1385 (1926), pp. 61, figs. 25*).—Eggs produced in the United States increased 331 per cent and chickens raised 440 per cent from June 1, 1880, to January 1, 1925, while the population increased but 125 per cent. With such rapid increases in the production of poultry products, the United States within a few years must be seeking additional foreign markets, and Europe seems to offer the most probable outlet for the surplus, particularly in dressed poultry. This bulletin describes the production and the commercial handling and marketing of poultry and eggs in the several countries of Europe and the demands and requirements that must be met to satisfy the European trade, especially that of England.

Cost of wheat production (*Union So. Africa Dept. Agr. Jour., 12 (1926), No. 2, pp. 176–180, fig. 1*).—This study is based on the returns for 1922 and 1923, and shows the cost of producing wheat in the several colonies to vary from 11s. 5d. per bag of 200 lbs. in the Orange Free State to £1 0s. 8d. in Swellendam. It is pointed out that since the Orange Free State had had practically no crop for three years previous to 1922 the average cost in that Colony was really 24s. per bag.

South Africa in 1923 produced 362,000,000 lbs. of wheat and imported but 285,000,000 lbs., making an average consumption of 300 lbs, per head, based on the white and colored population, or 100 lbs. per head if the native population is included, as compared with an average consumption of 480 lbs. per head in France and Belgium. The migration of natives to towns, the increase of their wealth and standard of living, together with the improved system of grinding wheat, are rapidly increasing the consumption of wheat, while the possibilities for increased production are limited.

It is believed that the price of wheat will not justify the rapid increase in the value of South African wheat lands so long as the price of wheat lands and cost of raising wheat are so low in Canada and elsewhere. It is thought that the large disparity in the wholesale price and the price the farmers receive, as high as 5s. 2d. per bag in 1921 and from 1s. 3d. to 7s. 3d. in 1924 and 1925, can probably be materially reduced by cooperative trading.

Cost of producing hogs in Iowa and Illinois, years 1921–1922, O. STEANSON and R. H. WILCOX (*U. S. Dept. Agr. Bul. 1381 (1926), pp. 31, figs. 11*).—This report embodies the results of a study of the costs and methods of hog production on 44 farms in 1921 and 39 farms in 1922 in Warren County, Ill., and Henry County, Iowa. The gross costs per 100 lbs. of marketable pork were in 1921 from \$3.07 to \$13.55, with 79 per cent produced at a cost between \$4 and \$6; in 1922 from \$4.86 to \$10.02 per 100 lbs., with 77 per cent produced at a cost between \$5 and \$7. The net costs of maintaining breeding herds were \$21.97 and \$24.91 per sow in 1921, depending on whether the one- or two-litter system was used, and \$14.24 and \$16.09, respectively, in 1922. The cost per 100 lbs. gain after weaning averaged \$4.17 in 1921 and \$5.40 in 1922 for spring pigs, and \$5.26 and \$6.37, respectively, for fall pigs. The average gross cost per 100 lbs. of pork produced was \$5.49 in 1921 and \$6.32 in 1922, equivalent to 15.2 bu. and 12.2 bu. of corn, respectively. The average profit per 100 lbs. was \$2.39 in 1921 and \$1.35 in 1922. The returns per bushel of corn fed were 69 cts. and 71 cts. as compared with average farm values of 36 cts. and 52 cts., respectively.

Sheep feeding and management, R. E. HODGSON (*Minnesota Sta., Waseca Substa. Rpt. 1919–1923, pp. 32, 33*).—The receipts and expenses of a small flock of registered sheep handled strictly as a market proposition are given for the five years 1919 to 1923. An average profit of \$127.53 per year is recorded.

[Cost of producing milk in the Denver area], L. R. MOORHOUSE (*Colorado Sta. Rpt. 1925, p. 27*).—Preliminary observations are made on the basis of the records of 33 owner operators in the Denver area in 1924. These owner operators had receipts amounting to \$1,214 per farm from sources other than the sale of milk; owners renting additional land received \$1,331 per farm from sources outside of the dairy, while tenants reported \$1,205 per farm for these enterprises. The owners maintained an average approximating 23 cows per farm; the owners renting additional land, about 21 cows; while the tenants had an average of 22 cows per farm. The average milk receipts per cow

were identical for the owner and owner-additional group, namely $111. The tenants had an average return of about $120 per cow.

Farm-accounting associations, E. C. Voorhies (*California Sta. Bul. 403 (1926), pp. 3–39, figs. 7*).—The organization and results of farm-accounting associations in the several European countries are described briefly, followed by a detailed description of such associations in Denmark. Appendixes give the individual results on 8 farms in 1923–24 with comments, and the results of the farm accounts of 200 farms in 1924–25. A bibliography is included.

Co-operation amongst dairy farmers, G. G. Neill (*Agr. Gaz. N. S. Wales, 37 (1926), No. 2, pp. 160–162*).—This article sets forth the advantages of butter factory companies registering under the Cooperation, Community Settlement, and Credit Act, 1923. Of the existing butter factory companies 23 have registered as cooperative societies, 10 have applied for registration, 10 intend to do so, and the remainder have been granted temporary exemption from the provisions of the act to enable them to consider registration.

The chief advantages of registration set forth are the right to use the term "cooperative" in name, exemption from certain taxes, power to compel members to agree to deliver all their produce to the society without such agreement being held illegal on the grounds of being in restraint of trade, and power to unite into associations.

Tenancy and ownership among negro farmers in Southampton County, Virginia, W. S. Scarborough (*U. S. Dept. Agr. Bul. 1404 (1926), pp. 27, fig. 1*).—This bulletin contains the results of a survey covering part of Southampton County, Va., a section in which probably 75 per cent of the farmers are colored and are independent of the supervision of white farmers. The average age of the 112 tenants included was 42 years and their average accumulations by their own efforts $806.51. The average age and accumulations of the 149 owners were 50.6 years and $5,412.63, respectively.

From 1880 to 1920 the percentage of farms operated by tenants increased from 45 to 59.2 per cent in Southampton County as compared with a decrease from 29.5 to 25.6 per cent for Virginia as a whole, and an increase from 25.6 to 38.1 per cent for the United States. From 1900 to 1920 the percentage of farms in Southampton County operated by negroes increased from 47.6 to 56.6 per cent, and the percentage of the negro operators who were owners increased from 24 to 28.2 per cent.

The changes in the utilization of the land, in the crops grown, in size and value of farms, in tenure, and in the value of livestock and equipment from 1860 to 1920 in Southampton County are described. The size and value of farms and of property, changes in tenure status, the net worth and kinds of property owned, indebtedness and credit, accumulations, the relation of the rate of accumulation to various conditions, the standards of living, and the extent of migration and degree of stability of occupancy are considered for the 261 farms surveyed.

Agricultural contracts ordinance (*Trinidad and Tobago Dept. Agr. Bul. 21 (1926), No. 1, pp. 43–69*).—The ordinance of June 18, 1925, consolidating and amending the law relating to agricultural contracts, is set forth. The ordinance covers all agreements for the possession of lands for cultivation of all crops except sugar cane.

An economic study of the agriculture of the Connecticut Valley.—II, Connecticut market demand for vegetables, I. G. Davis and F. V. Waugh (*Connecticut Storrs Sta. Bul. 138 (1926), pp. 23–48, figs. 12*).—This is a continuation of a series previously noted (E. S. R., 54, p. 489). A study was made at six of the most important markets of Connecticut of the market

demand for vegetables which may be grown in the State. The carload arrivals at these markets represent about 65 per cent of the total receipts of vegetables in the State. Such lots increased from 2,871 cars in 1917 to 5,281 cars in 1924. Of the 1924 receipts 2,076 cars of potatoes and 874 cars of other vegetables were received during the periods when they were in competition with home-grown vegetables.

The study shows (1) that there is opportunity for growing a slightly larger acreage of certain vegetables and for about 6,000 additional acres of potatoes, (2) that lack of adequate storage facilities is shortening the marketing season for vegetables grown within the State and decreasing the production of semiperishable vegetables, and (3) that the larger marketing problem of the State is to meet competition of highly organized outside agencies that grade and pack their product to attract consumers, that sell through organized channels, and that can furnish an almost continuous supply of products of dependable quality.

Agricultural survey of Europe: Germany, L. G. MICHAEL (*U. S. Dept. Agr. Bul. 1399 (1926), pp. 112, figs. 7*).—This is one of a series of surveys of the agricultural situation in foreign countries made to determine the potential demand for agricultural products and the nature and extent of the competition the farmers of America must meet in disposing of their surplus in foreign markets. Comparisons are made between the pre-war and post-war trends in agriculture in the several countries as affected by economic conditions, territorial changes, and other factors brought about by the World War.

Comparing the acreages planted in 1924 in the Republic of Germany with the average acreage in 1909-1913 in the same territory, wheat decreased 404,000 acres, rye 2,188,000 acres, oats 817,000 acres, and sugar beets 199,000 acres, while barley increased 107,000 acres and potatoes 45,000 acres. The official census of December 1, 1924, shows a decrease of 1,180,000 cattle and 5,689,000 swine from the official estimates of December 1, 1913. Germany has thus changed from a position of balanced agriculture, producing 89.7 per cent of its meat requirements, 64.2 per cent of its fat requirements, and 84.2 per cent of its cereal requirements, to a situation of subordinated agriculture, producing only 64.4 per cent of its meat requirements and only 61.6 per cent of its wheat, rye, barley, and oats requirements.

The following table shows the changes in the volume of German imports of American agricultural products since the war:

German imports of American agricultural products, index numbers of volume, base 1913

Commodity group	1913	1921	1922	1923	1924
Cotton	100	62	54	38	55
Meats and fats	100	183	84	134	131
Breadstuffs	100	186	107	81	115
Feedstuffs	100	69	187	30	41
Tobacco	100	130	99	134	188
Total	100	105	75	61	78
Total, less cotton	100	164	104	92	109

The effect of the various economic conditions before and since the war and that of the Treaty of Versailles are discussed in their relation to German agriculture in general. Each crop, kind of livestock, and agricultural product is described, giving data as to the pre-war situation, the effect of the Versailles Treaty, the post-war situation, and the importations into and exportations from Germany since the war.

A self-reliant farming community (*Union So. Africa Dept. Agr. Jour., 12 (1926), No. 1, pp. 1–4*).—Variable climate, droughts, floods, and locusts in South Africa result in abundance one year and want the next. Since State insurance might require the payment of losses as high as £10,000,000 for livestock alone in the years of severe drought, the Minister of Agriculture proposes a Farmers' Mutual Benefit Fund of £10,000,000 to use for relief loans to farmers. Such loans are to run for a maximum period of seven years with interest as follows: First year none, second year 1 per cent, third year 2 per cent, fourth year 3 per cent, and the fifth to seventh years 4 per cent. The maximum loan is not to exceed £300.

Funds are to be raised by direct levy on all bona fide farmers according to a schedule ranging from 10s. annually for farmers with estimated incomes of less than £100 per annum to £1 plus 5 per cent of their income tax for farmers with incomes in excess of £300." It is estimated that these levies will raise £75,000 per annum, but only the interest on the fund is to be used until £2,000,000 has been accumulated.

Crop and livestock statistics, Ontario, 1925 (*Ontario Dept. Agr., Crop Bul. 165 (1925), pp. 32*).—Statistics of acreage planted, yields of field crops, and livestock by counties, and acreages and yields of field crops for the entire Province for the years 1921 to 1925 are given, together with averages for the period 1882–1925.

Report of the [Queensland] Registrar-General on agricultural production for the year 1924, G. Porter (*Queensland Registrar-Gen. Rpt. Agr. Prod. 1924, pp. 37*).—This report presents statistics for the area under cultivation, in pasturage, and irrigated; the size of farms; the labor employed and the capital invested in machinery and implements; acreage, yields, and values of various crops and fruits; and for the dairy, bee, sugar, and wine industries. Comparative figures for 1923 are included in the tables and for periods of from 5 to 34 years in most of the important tables.

Principal exports in the French colonies in 1924 [trans. title], C. Chalot (*Agron. Colon., 14 (1926), No. 97, pp. 18–37*).—The report shows the exports from the French colonies of all classes of products in 1924.

Reviews of the frozen meat trade [1924–1925], W. Weddel & Co., Ltd. (*Weddel's Ann. Rev. Frozen Meat Trade, 37 (1924), pp. 26, pl. 1; 38 (1925), pp. 28, pl. 1*).—These reports continue the summary of the British trade in frozen meats during 1924 and 1925, previously noted (E. S. R., 51, p. 274).

Statistics of dairy factories, 1924, R. H. Coats (*Canada Bur. Statis., Dairy Factories, 1924, pp. XVIII+70, figs. 2*).—This contains the usual statistics on the production of dairy products in Canada during 1924 (E. S. R., 53, p. 178).

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Workers in subjects pertaining to agriculture in State agricultural colleges and experiment stations, 1925–1926, M. A. Agnew (*U. S. Dept. Agr., Misc. Circ. 58 (1926), pp. III+105*).—This is the usual list, compiled with the assistance of B. T. Richardson (E. S. R., 53, p. 298).

County agricultural agent work under the Smith-Lever Act, 1914 to 1924, W. A. Lloyd (*U. S. Dept. Agr., Misc. Circ. 59 (1926), pp. II+60, figs. 11*).—A historical account, some phases of which have been discussed editorially (E. S. R., 55, p. 1).

Technical Education Act, H. H. Ward et al. (*Canada Dept. Labor Rpt. 1924–25, pp. 70–118*).—This report covers the courses taught, enrollment, attendance, teaching staff, etc., in agriculture, home economics, and other subjects under the Technical Education Act.

[**Reports of the International Education Board for the period from February 3, 1923, to June 30, 1924, and for the year ended June 30, 1926**], W. ROSE ET AL. (*Internatl. Ed. Bd. Rpts. 1923–24, pp. IX+27; 1924–25, pp. IX+28*).—The International Education Board was incorporated in January, 1923, to cooperate with foreign institutions and agencies in conducting and promoting education, thus supplementing the General Education Board, the charter of which limits its activities to the United States. The work of the board is concentrated on the advancement of scientific research and the promotion of agricultural science and practice. To facilitate the exchange of experience in agriculture in 1923–24 20 fellowships were awarded in 9 countries, and in 1924–25 40 fellowships in 16 countries. These fellowships cover a wide range of subjects. Exchange of specialists between institutions in different countries has also been arranged in certain cases.

The history and present status of agricultural education in China, C. C. CHEN (*Chinese Students' Mo., 21 (1926), No. 4, pp. 13–17*).—A brief history of the development of agricultural education since its inauguration in 1902 is given.

In 1922–23 there were 7 agricultural colleges and 77 provincial high schools and 318 primary schools of agriculture and sericulture. It is pointed out that Chinese agriculture is not reaping the full benefits of these institutions, due to the fact that 80 per cent of them are located in the cities and but few of the graduates go back to actual farm life.

Policies of the Federal Board for Vocational Education, approved December 17, 1925 (*Fed. Bd. Vocat. Ed., Monog. 2 (1926), pp. 18*).—The rulings, effective June 30, 1926, as to the qualifications of teacher trainers in agricultural, trade, home economics, and industrial education, and the use of Federal teacher training funds for salaries of local supervisors are set forth.

Cooperative marketing in the schools (*Jour. Natl. Ed. Assoc., 15 (1926), No. 2, p. 52*).—This article sets forth the policy of the department of rural education of the National Education Association, which is to stress the teaching of courses pertaining to cooperative marketing. The department of rural education has appointed a committee to select the facts and prepare textbooks and courses to be given in cooperative marketing. This committee consists of agricultural economists, editors of agricultural papers, officers of cooperative enterprises, and rural and vocational educators.

Economics: Principles and problems, L. D. EDIE (*New York: Thomas Y. Crowell Co., 1926, pp. XX+799, figs. 54*).—This is an introductory textbook on economics for university students and general readers, and sets forth both the orthodox economic principles and the modern developments.

One chapter (pp. 320–345) is devoted to the problems of agriculture, dealing with them under the following heads: The balance (1) of farm income with general income, (2) of farm accumulation of wealth, (3) of population between agriculture and industry, (4) of production between agriculture and industry, and (5) of farm prices with other prices; land ownership and tenancy; taxation of farm land; transportation and marketing of farm products; agricultural credit; international agricultural relations; and farm management.

Farm economics, F. W. HOWE (*New York: Amer. Book Co., 1926, pp. 221, figs. 55*).—This textbook on farm economics, which is defined as the science underlying successful farm organization and management, includes a discussion of the study of farm income and profits, records and accounts, prices and marketing, labor, crops, livestock, systems and types of farming, tenure, and machinery.

FOODS—HUMAN NUTRITION

Report of the Food Investigation Board for the year 1924, W. B. Hardy et al. (*[Gt. Brit.] Dept. Sci. and Indus. Research, Food Invest. Bd. Rpt. 1924, pp. VI+80, pls. 8, figs. 39*).—This annual report of the Food Investigation Board of Great Britain (E. S. R., 53, p. 260) consists of six sections dealing, respectively, with the theory of freezing, the preservation of eggs and meat, the preservation of fish, the preservation of fruit and vegetables, the chemistry of oils and fats, and engineering problems in refrigeration.

In the first section brief reports are given of special studies on The Effect of the Rate of Cooling and Thawing upon the Final Distribution of Water in a Gelatin Gel, by T. Moran and H. P. Hale; The Velocity of Ice Crystallisation through Super-cooled Gelatin Gels, by E. H. Callow; Changes of State in White and Yolk of Hens' Eggs which Have Been Frozen, and the Effect of Temperature upon the Life of the Egg, by T. Moran; and Osmotic Pressure of Solution of Protein, by G. Adair. The gelatin studies indicated that differences in the rate of freezing a mass of colloid material bring about marked differences in the location of the ice. If the rate of freezing is slow ice forms slowly on the external surface, and if rapid within the mass. Cold appears to increase the water chemically bound to the protein, and the change is irreversible. The pasty condition of egg yolks after having been kept for a short time at temperatures below —6° C., as noted in the previous report, is explained as the precipitation of the lecitho-vitellin in the yolk. The optimum temperature for retaining the fertility of eggs for the longest space of time was found to be in the region of 8 to 10°. At temperatures below zero fertility is rapidly lost. It was found that other factors, such as species of the hen, feeding of the hen, and thickness of the shell, affect the life period of the egg in cold storage.

The subcommittee reports in section 2 include The Preservation of Eggs, by T. Moran and J. Piqué; The Freezing of Meat, by T. Moran; The Lactic Acid Production in Muscle, by D. L. Foster; Succinic Acid in Muscle, by D. M. Needham; and Conditions Governing the Growth of *Staphylococcus aureus*, by G. S. Graham-Smith and F. W. Foreman. The last-named report includes a discussion of the advantages of the Foreman method of determining amino acids (E. S. R., 44, p. 411). The fifth section includes brief reports of studies on The Synthesis of the Higher Unsaturated Acids, by R. and G. M. Robinson; The Chemistry of Glycogen, by J. Irvine and H. Gilchrist; The Formation of Fat by Yeast, by I. S. MacLean and D. Hoffert; and Natural Oleic Acid, by A. Lapworth and E. N. Mottram.

Food plants of British Guiana, J. B. Harrison and C. K. Bancroft (*Jour. Bd. Agr. Brit. Guiana, 19 (1926), No. 1, pp. 18–51*).—A compilation is given of the food plants occurring in British Guiana, with notes on their uses and in some cases data on their composition and nutritive ratio.

The physical composition of a lean, a half fat, and a fat beef carcass and the relative cost of the nutrients contained in each, A. T. Edinger (*Missouri Sta. Research Bul. 83 (1925), pp. 5–63, figs. 23*).—Three steers of about the same weight but varying in age and condition were fasted for 24 hours, weighed, and slaughtered, after which the carcasses were allowed to chill for 48 hours in the chill room at a temperature of 38° F. and then weighed, and the right halves divided into the usual wholesale and retail cuts, the weights being recorded for edible meat and refuse. The retail cuts were then divided into fat, lean, and bone, and from the percentages of these the proportions in the wholesale cuts were calculated. Instead of analyzing the cuts chemically,

data obtained in previous studies conducted on carcasses of similar condition were used for calculations of the protein and total energy of the various portions. Finally by an application of current market prices to the retail cuts, the relative economy of the various cuts was calculated.

The dressing percentages varied directly with the condition of the steers. The one ranking highest in condition had the highest dressing percentage and largest amount of external fat, the half-fat steer next, and the thin last. The weights of the empty internal organs were about the same. The amount of internal fat increased with the degree of fatness and the breeding of the animal.

The percentages of the different cuts in the carcasses showed only slight variations in the different animals. With increasing fatness there was an increase in the loin, a slight increase in the plate, and a decrease in the chuck. The proportion of fat, lean, and bone varied considerably, the thin steer containing 24 per cent more lean, 20 per cent less fat, and 5 per cent more bone than the fat steer of about the same weight.

The amount of protein in the lean meat was largest in the half-fat animal. The meat of the thin steer was characterized by a higher percentage of water and of the fat steer of fat. The total calories per pound of boneless meat was highest in the fat animal. The relative food values did not correspond to market prices. The cost of boneless meat from the loin and rib was 50 per cent higher in the fat than in the thin steer and that of lean 150 per cent higher The lean from round and chuck of the fat steer was 25 per cent higher than from the thin steer and the total meat from the plate about the same in both. In every cut of the fatter animal the cost of a given amount of protein was higher and of 1,000 calories lower than that of the thin.

The various cuts in order of increasing cost of protein were chuck, round, rib, and loin. As a source of lean meat porterhouse steak was the most expensive cut of the fat carcass and club steak of the lean. The least expensive cuts were clod and plate, respectively. As a source of total boneless meat the chuck was the least expensive, followed by flank, round, sirloin, club, and porterhouse.

Vegetables: Chayote, yautia, plantain, banana, E. M. WILLSEY (*Porto Rico Dept. Ed., Trop. Foods Bul. 1 (1925), pp. 30*).—This is the first of a series of bulletins in which it is planned to standardize the traditional food recipes of Porto Rico and introduce new ways of serving tropical vegetables. The foods considered are the chayote, yautia, green and ripe plantains, and green bananas, for each of which several tested recipes are given.

California cook book, compiled by F. P. BELLE (*Chicago: Regan Pub. Corp., 1925, pp. 154*).—Of special interest in this collection of recipes is the chapter on Spanish dishes, in which have been collected many old Spanish recipes, and the chapters on salad and salad dressings and beverages, which include unusual combinations of fruits.

Handbook for bakers, A. F. GERHARD (*New York and London: Century Co., 1925, pp. XIX+484, pls. 47, figs. 15*).—Although this handbook is written especially for commercial bakers, considerable information applicable to baking on a small scale is to be found in the sections on raw material, technology of bread making, cake ornamenting and decorating, and sweet goods manufacture and recipes.

How to make good bread from Missouri soft wheat flour, E. M. DAVIS and J. A. CLINE (*Missouri Sta. Bul. 241 (1926), pp. 8, figs. 7*).—In a previous investigation on the same subject (E. S. R., 53, p. 58) compressed yeast was used in the recipes developed. On account of the relatively high cost of this as compared with dry and liquid yeast, the study was extended to the use of

these in place of compressed yeast. The work with dry yeast is reported in this publication.

It was found possible to make a good bread from the soft wheat flour with dry yeast. The best results were obtained when a preliminary fermentation was carried on with scalded flour or potato. Recipes are given for making bread under these conditions with potato water, milk, and buttermilk as the liquids.

What is the saturation point?—Some results of feeding experiments with bread as a component of the diet, C. B. Morison and R. H. Shaw (*Baking Technol., 5 (1926), No. 2, pp. 49–53, figs. 2*).—To determine what proportion of the diet can be given to bread without nutritional disturbances, five groups of 6 young rats each were placed on the following diets: (1) The basal diet alone, (2) basal diet 75 per cent and dried milk bread 25 per cent of the total calories, (3) basal diet 50 and dried milk bread 50 per cent, (4) basal diet 25 and dried milk bread 75 per cent, and (5) dried milk bread exclusively. The basal diet was a supposedly complete diet consisting of casein 20, butterfat 15, starch 56, salt mixture 4, and dried yeast 5 per cent. The bread was made from a formula to conform with the Federal standard for milk bread and was fed dried and ground to a coarse meal. Analyses are given of the basal diet and the bread, with data on the food intake and growth of the animals for the 70 days of the experiment.

The food intake and growth of the animals receiving 25 and 50 per cent of bread were similar to those receiving the complete basal diet. With 75 per cent of bread the food intake declined and growth was not so satisfactory, and on bread alone there was but little growth.

The fixity of basal metabolism, F. G. Benedict and E. E. Crofts (*Natl. Acad. Sci. Proc., 11 (1925), No. 10, pp. 585–588*).—An abridged report of an investigation noted previously (E. S. R., 54, p. 692).

Studies in the nutrition of the white mouse, I–IV, H. H. Beard (*Amer. Jour. Physiol., 75 (1926), No. 3, pp. 645–695, figs. 22*).—The four papers noted below cover a systematic investigation of the nutritive requirements of the white mouse with a view to its use in place of the white rat in nutrition investigations.

I. *The normal growth and nutritive requirements* (pp. 645–657).—In this paper are presented the growth and food intake records for 27½ weeks after weaning of 7 male and 8 female mice on a standard diet of casein 31, starch 38, Crisco 21, Osborne and Mendel's salt mixture 7, and cod-liver oil 3 per cent, with a 100-mg. tablet of dried yeast daily. Curves of average growth of both sexes, tables and charts showing the energy intake in relation to size for males from 10 to 34 and females from 9 to 27 gm. in weight, and curves showing the effect of various proteins and the presence or absence of mineral salts on growth are also given.

Average adult weights of 27 gm. for females and 34 for males were secured. The curves for calories per day in relation to body weight were almost identical for the two sexes and similar to the growth curves for body weight plotted against days, both being logarithmic in character. The curve of calories per day plotted against the two-thirds power of the weight was more definitely, though not absolutely, linear. It is concluded that in regard to total metabolism mice obey the surface area law.

In the protein studies the best growth with casein was obtained at a level of 25.1 per cent of the calories, or 31 per cent of the food mixture, but equally good growth was obtained with 12 per cent of casein fortified by 0.5 per cent of cystine. Egg white behaved similarly to casein. On 31 per cent of gliadin

growth was almost stationary. A concentration of at least 7 per cent of the Osborne and Mendel salt mixture appeared to be necessary for growth.

II. *The effect of feeding diets rich in protein and diets containing unbalanced salt mixtures.—The rôle of certain sulfur components* (pp. 658–667).—On diets rich in protein (from 75 to 80 per cent) growth was subnormal, but no marked differences in the weight of the liver and kidneys resulted after periods as long as 107 days.

Mice fed for a long period of time on the Sherman-Pappenheimer and Osborne-Mendel-Park rachitic diets showed no rachitic changes in the bones as examined by gross and histological methods. The conclusions of Mitchell (E. S. R., 51, p. 767) that taurine can successfully replace cystine could not be confirmed.

III. *Vitamin factors in the nutrition of mice* (pp. 668–681).—In the vitamin studies it was demonstrated that vitamin A is essential to the growth of mice, but that in its absence xerophthalmia does not appear as readily as in rats and some other species of animals.

The vitamin B studies corroborated those of Osborne and Mendel for rats (E. S. R., 53, p. 566) and Cowgill, Deuel, and Smith for dogs (E. S. R., 54, p. 194) in pointing to a definite relationship between the vitamin B requirement of an animal and its size and metabolic rate. An amount of 40 mg. of yeast vitamin powder daily was found adequate for growth up to a body weight of 18 gm. The vitamin B constant *K* of Cowgill et al. noted on page 293 was found to vary from 0.0121 to 0.0136 as compared with 0.00027 to 0.00038 for rats and 0.00000014 to 0.00000019 for dogs.

Vitamin C appeared to be nonessential to normal growth.

IV. *The relation between diet and reproduction* (pp. 682–695).—This is essentially a repetition of the work of Mason on rats (E. S. R., 55 p. 194). The same diet was used except for a higher concentration of casein (31 per cent), which was not purified by extraction of alcohol and ether. The results obtained were similar to those of Mason and afford additional confirmation of the necessity of vitamin E for normal reproduction. In the male mice evidence of slight degeneration as judged by histological examination was obtained in 105 days and of more marked degeneration in 180 days. Fresh green lettuce fed three times a week with the basal diet was effective in curing and preventing sterility but did not induce normal lactation.

The vitamin content of foodstuffs, W. H. Eddy (*Amer. Jour. Pub. Health, 16 (1926), No. 2, pp. 109–115, figs. 3*).—This paper deals chiefly with possible sources of error in several of the standard methods of determining the relative value of foodstuffs as sources of vitamins A, B, and C. Hitherto unpublished data are given on the content of vitamins A and C in ripe bananas.

Preliminary results on vitamin A showed close agreement with those reported by Munsell (E. S. R., 54, p. 614), indicating that the banana has only about one-fifth of the value of butter as a source of this vitamin. As a source of vitamin C, 5 gm. of banana is considered the minimum protective dose and from 8 to 10 gm. the optimum dose for growth stimulation as well as scurvy prevention. Definite results have not yet been obtained in the vitamin B experiments.

The persistence of vitamin A in plant tissues, K. H. Coward (*Biochem. Jour., 19 (1925), No. 3, pp. 500–506, figs. 4*).—Supplementing earlier work on the synthesis of vitamin A in plant tissues (E. S. R., 49, p. 767), the author has attempted to determine at what point in the history of plant tissue the vitamin A synthesized by the tissue is destroyed. For this purpose wheat seedlings grown under varying conditions were tested for vitamin A in the usual manner.

Etiolated shoots about 3 in. long were found to contain no traces of vitamin A. The same shoots after 1 day's growth in the light contained a small amount of vitamin A, which was not destroyed or removed by diffusion after the shoots had been kept for 24 hours with their ends immersed in water and not entirely removed by standing on the plant in the dark for 24 hours or even for 16 days. Withered leaves tested 43 days after the seeds were planted had no traces of vitamin A.

A comparison of green and yellowing autumn leaves of trees, watercress, and cabbage indicated that the yellow leaves are even richer than the green in vitamin A, but that the vitamin is destroyed when the leaf dries up and dies. It is concluded that the vitamin A in plant tissue persists until the death of the tissue.

Is A-vitamin secreted through the skin?—Experimental investigations on A-vitamin in wool fat, S. V. Gudjonsson (*Amer. Jour. Physiol., 75 (1926), No. 3, pp. 533–541, figs. 4*).—A limited amount of evidence is presented indicating that wool fat from Iceland sheep contains an appreciable amount of vitamin A. The fat from samples of Argentine sheep's wool of unknown history, bought in Copenhagen, contained no appreciable amounts of vitamin A.

***On the effect of deficiency of vitamin A on the blood-platelet count in* rats,** A. D. Stammers (*Brit. Jour. Expt. Path., 6 (1925), No. 6, pp. 312, 313*).—The contradictory results reported by Cramer, Drew, and Mottram (E. S. R., 50, p. 565) and Bedson and Zilva (E. S. R., 49, p. 562) for the blood platelet count of rats suffering from a deficiency in vitamin A are reviewed briefly, and data are reported on the red cell and blood platelet counts of young and adult rats at the end of 90-day periods on a vitamin A deficient diet previously described (E. S. R., 46, p. 256). The technique employed was that described by Cramer, Drew, and Mottram, except that a slightly different optical system was used.

The range in the platelet count in the young rats was 758,000 to 920,000 on the first day and 742,000 to 940,000 on the ninetieth, and in the adult rats 847,000 to 980,000 and 841,000 to 976,000, respectively. These slight changes are considered to be within the limits of experimental error, and thus to confirm the opinion of Bedson and Zilva that a reduction in the platelet count of rats is not a specific lesion of vitamin A deficiency.

***The nutritive value of Philippine cereals.*—I, The vitamin B content of glutinous rice, dead rice, and adlay,** F. O. Santos and E. G. Collado (*Philippine Agr., 14 (1926), No. 8, pp. 473–477, fig. 1*).—A limited amount of evidence is presented indicating that glutinous rice and adlay furnish sufficient vitamin B for the growth of rats when constituting 66 per cent of a ration satisfactory with respect to other factors, but that dead rice (ordinary rice which has undergone fermentation through being stored when not completely dried) does not furnish enough vitamin B at the same level.

Observations on vitamin-B and metabolism, R. H. A. Plimmer and J. L. Rosedale (*Jour. State Med., 34 (1926), No. 2, pp. 117–121*).—The method used in the study reported on the relative value of various cereal grains as sources of vitamin B was to feed a pair of pigeons on the cereal in question with 5 per cent of fish meal to supply protein and mineral matter, and after the birds had reared a pair of young to replace part of the cereal by varying amounts of white rice or white flour. Continued maintenance for from 6 to 12 months, with rearing the young, was used as the criterion for sufficiency of vitamin B. The results obtained, expressed as the amount of the cereal which must be present to satisfy these conditions, are given tentatively as follows: Whole wheat flour 75 per cent, whole rye 66, whole barley 66, millet 60, oatmeal 95, bran 30, middlings 30, and wheat germ 6 per cent. In com-

parison with these the value of yeast extract is given as 8 per cent, dried yeast 6, and potato 80 per cent.

A few experiments are also reported in which an attempt was made to determine the ratio of vitamin B requirement to carbohydrate, protein, and total calories, with the conclusion that there is a definite relationship between vitamin B and total calories rather than vitamin B and carbohydrates as suggested by various workers.

Quantitative aspects of the function of vitamin B in several species, G. R. Cowgill, A. H. Smith, and H. H. Beard (*Jour. Biol. Chem., 63 (1925), No. 1, Proc., pp. XXIII, XXIV*).—From studies on the vitamin B requirement of rats, mice, and dogs, the authors have drawn the conclusion that in the adult animal the vitamin B requirement is proportional to the product of the two-thirds power of the weight, the total calories utilized from the food, and the body weight. The formula expressing these factors is as follows:

$$\frac{\text{Vitamin B}_{\text{per day}}}{\text{Weight}^{\frac{2}{3}}} = K_{\text{vitamin}} \times \text{calories}_{\text{per day}} \times \text{weight or}$$

$$K_{\text{vitamin}} = \frac{\text{vitamin}}{\text{calories} \cdot \text{weight}^{\frac{5}{3}}}.$$

It is stated that this formula gives good agreement with experimental data for adult rats, dogs, and mice, the value of K being greatest with the mouse and smallest with the dog. The value depends upon the source of vitamin B used in the test and the particular set of conditions maintained.

Insulin treatment of undernutrition in nondiabetic subjects [trans. title], R. Feissly (*Presse Méd.* [*Paris*], *34* (*1926*), *No. 13, pp. 196–199, figs. 2*).—The author reports the successful use of insulin injections as an aid to fattening diets in cases of chronic undernutrition. The response to the insulin injections in increased appetite, greater consumption of food, and gain in weight was prompt and marked in the cases reported. This was accompanied by no change in the basal metabolism, but by an increase in the pH values of the blood plasma and an increase in muscular tone. In discussing the technique of the treatment, it is stated that clinical supervision is as indispensable as in diabetes. Two or three injections of insulin are given daily in amounts up to 60 units a day, each injection being followed in one-half hour by a meal rich in carbohydrates. The treatment is continued for three or four weeks.

TEXTILES AND CLOTHING

Classification of cotton by microscopy, W. M. Mebane and F. C. Vilbrandt (*Amer. Dyestuff Rptr., 15 (1926), No. 7, pp. 279–282, figs. 5*).—Studies at the University of North Carolina of samples of cotton lint obtained under varied field conditions and examinations of commercial fabrics indicated that microscopic examination of cotton fibers discloses the growth conditions at picking time, and that such classification truly classifies their textile value. Both weight ratios of cotton to seed and the rag doll germination test indicated the growth condition of the fiber. This condition made itself evident in finished fabrics both in the dyeing and chemical treatment of the fibers. Better supervision of picking might improve the quality of the fiber collected.

Measurements of the reversing spiral in cotton hairs, W. L. Balls and H. A. Hancock (*Roy. Soc.* [*London*], *Proc., Ser. B, 99 (1926), No. B 695, pp. 130–147, figs. 11*).—A detailed account of the research noted (E. S. R., 54, p. 795).

Comparative spinning tests on machine-ginned and saw-ginned cotton—Punjab-American type 289 F, A. J. Turner (*Bombay: Indian Cent. Cotton Com., Tech. Lab., 1926, pp. 7, figs. 2*).—With cotton lint ranging from [illegible] to

1⅛ in. in staple, saw-ginned stock showed less blow-room and card loss and in spinning tests gave fewer yarn breakages and yarns stronger, more even, and less neppy than did roller-ginned cotton.

Fabric analysis: The contraction of warp and weft, H. Hartley (*Jour. Textile Inst., 17 (1926), No. 5, pp. T254–T258, pl. 1*).—This paper describes an instrument designed to measure the contraction of warp threads and weft picks in fabric.

Wearing tests on textile fabrics, W. F. Edwards (*Textile World, 69 (1926), No. 23, pp. 89, 91, figs. 5*).—The principles involved in several types of wear testers are described and illustrated.

Washing instructions for rayons (*Textile World, 69 (1926), No. 22, p. 75*).—Based on tests in general types of home laundry machines, tentative recommendations are proposed for washing rayon knit underwear. A method is also suggested for washing wool and wool-cotton knit underwear.

HOME MANAGEMENT AND EQUIPMENT

Investigation of warm-air furnaces and heating systems, II, A. C. Willard, A. P. Kratz, and V. S. Day (*Ill. Univ., Engin. Expt. Sta. Bul. 141 (1924), pp. 152, figs. 91*).—This is the fourth progress report of studies being conducted in cooperation with the National Warm-Air Heating and Ventilating Association (E. S. R., 49, p. 288). A series of tests of the same furnace using anthracite coal and bituminous coal to compare the performance and to determine the effect of the use of a slotted fire pot on the operation with bituminous coal have been previously noted (E. S. R., 51, p. 486).

Studies of the performance of a cast-iron circular radiator furnace showed that since in practice the furnace is controlled by a combination of dampers which in turn determine the intensity of the draft at the smoke outlet, the draft becomes the controlling factor in furnace operation, and the other factors necessarily become functions of or are dependent upon the draft. In order to warm the house rapidly, combustion rates much higher than the average daily rate are required for short periods of time. To meet these conditions a satisfactory chimney must produce a draft intensity of from two to three times the differential draft required for the average rate of combustion on which the design of a plant is based.

Comparisons of a steel crescent radiator furnace and a cast-iron circular radiator furnace showed that the steel furnace requires greater draft differential between the smoke outlet and the ash pit to operate at a given combustion rate. The efficiency was higher for the steel furnace and was more nearly constant over the whole range of combustion rates. The capacity developed at the bonnet was practically the same for the two furnaces. The results are taken to indicate in general the desirability of high ratios of heating surface to grate surface.

Experiments on the effect of varying the casing diameter showed a similar effect for the two types of furnaces. Beginning with the smallest casing a decrease in capacity and efficiency occurred when the casing diameter was enlarged 2 in. The next increase in casing diameter resulted in an increase in efficiency and capacity, while a still further increase in casing diameter again resulted in a decrease in efficiency and capacity. The best results were obtained on both furnaces with a casing having a ratio of free area to gross area of approximately 0.46 and a ratio of free area to leader area of 1.35. The 50-in. casing was the smallest that it was practicable or possible to use. The data indicate that a somewhat further reduction in casing size may give still greater capacities per square inch of free area through the furnace.

However, it was found that when the ratio of leader pipe area to free area is increased much above 1 to 1, the plant may breathe, or some one of the warm air pipes may act as a cold air duct.

Experiments are reported on three bonnet constructions including (1) a conical bonnet with side outlet collars, (2) a cylindrical bonnet with side outlet collars but with leader pipes in the same position as in (1), and (3) a shallow cylindrical bonnet with elbow outlets in the top, leader pipes horizontal, and tops of leaders at the same elevation. For combustion rates below 9 lbs. of coal per square foot of grate area per hour the third bonnet gave 10 per cent more heat available at the register than the first bonnet, and 3 per cent more than the second bonnet. Above this combustion rate, however, the performance of the third bonnet fell below that of the second bonnet, and at still greater combustion rates it fell below that of the first bonnet. The weight of air did not increase in the third bonnet as rapidly as in the first and second bonnets. At any given register air temperature above 200° F. the bonnet capacity was lower for the third bonnet than for the first or second bonnets. At a combustion rate of 10 lbs. of coal per square foot of grate per hour the register air temperature for the third bonnet fell below that for the second bonnet, and at a combustion of a little over 11 lbs. it fell below that of the first bonnet. The results are taken to indicate that the cylindrical bonnet with side outlets was the most satisfactory over the entire range of operation of the furnace.

Tests of two types of recirculating ducts showed that the round duct with 45° elbows and without the unsatisfactory right angle bends of the rectangular ducts handled a much greater quantity of air and developed a greater amount of heat available at the registers than the rectangular duct.

Using a centrifugal fan as an auxiliary to a furnace heating system, the increase in the weight of air passing through the furnace in pounds per hour when the fan was running was equal to the fan capacity in pounds of air per hour in only one case. Hence there was practically never any inductive action produced by the fan and nozzles, as the increase in weight of air flowing was less than the fan capacity in pounds of air per hour except at one temperature.

Tests of the effect of register grilles on piped furnace plant capacity showed no increase in capacity in the case of the open register boxes on the hot side of the system. No appreciable increase in capacity was indicated in the case of open faces with the sloping top plates on the hot side. An increase in capacity of 6.5 per cent at high temperatures, 4 per cent at moderate temperatures, and 1 per cent at low temperatures resulted when the cold air register was removed. These results are taken to indicate that warm air register grilles do not offer an appreciable resistance to the flow of heated air, provided the free areas are not reduced below 70 per cent of the gross areas.

Studies of heat emission from the heating surfaces for three types of furnaces showed that the heat emitted is independent of the type or size of casing or bonnet. The heat absorption by the circulated air was found to be affected by variations in the types of casings used. The data indicate that in general when the ratio of heating surface to grate surface is low, the unit heat emission is high, but that the higher unit emission is brought about by correspondingly higher surface temperatures. The data also indicate that the ash pit is effective heating surface, although it is not ordinarily included as such. It was also found that the unit heat emission from the fire pot decreased with increasing combustion rates when bituminous coal was used.

Experiments on the effect of inner casings and radiation shields on furnace performance showed marked increases in furnace efficiency, capacity, and

register air temperature from the use of the radiation shield, the increase in capacity amounting to 7.5 per cent at an average rate of combustion. No difference could be detected between the performances with the short and the long shields. The actual heat available at the registers of the plant for any assumed rate of combustion was increased approximately 8.5 per cent by the use of the shield. Intercepting the radiant heat from the hot castings reduced the casing temperatures from 150 to 105° at low rates of combustion and much more at high rates, and reduced the heat losses about 0.25 or 3 per cent of the heat of the fuel. The temperature of the shield ranged from 310 to 510°, approximately the same as the temperature of the ash pit.

Tests of insulation and heat loss of a furnace showed that for the same combustion rate substantial increases in capacity and efficiency resulted from the insulation, and higher register air temperatures were obtained. The efficiency of the furnace increased from 60 to 66 per cent at the moderate combustion rate of 6 lbs. of fuel. The principal reduction in heat loss was obtained from the furnace front, although some saving resulted from the insulation of both bonnet and floor. The use of insulating material on leader pipes showed no beneficial effect on furnace economy or heating capacity.

From the standpoint of over-all thermal efficiency with the same internal stack dimensions the double wall stack seemed to be the best, but with the same external dimensions the single wall stack is preferred. The nonvented stack had the greatest heat delivering capacity at the register because of the higher mean air temperature in the stack and the resulting greater motive head.

There was a large increase in the heat available at the register per square inch of leader for any given leader and stack as the register air temperature and the height of the stack were increased. This was especially true with regard to the leader when increasing the height from the first to the second floor level. The heat-carrying capacity of a leader was not proportional to the area of the leader, but was more nearly proportional to the area of the stack provided the stack was always as small as or smaller than the leader.

For a given register air temperature the relation of heating effect to height was not a direct one, the heating effect increasing at a lesser rate than the height. For a constant heat input to the furnace the heating effect may be actually reduced as the height increases.

Experiments on humidity and evaporating pans showed that the proper humidification can not be obtained by placing pans on low temperature surfaces, such as hot water or steam radiators, unless an excessive amount of water surface is exposed. Water temperatures of from 120 to 130° were found to represent the maximum that can be obtained by such arrangements.

MISCELLANEOUS

The Thirty-eighth Annual Report of the Colorado Agricultural Experiment Station for the Year 1925, C. P. Gillette et al. (*Colorado Sta. Rpt. 1925, pp. 45*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1925, a report of the director on the work of the station, and departmental reports. The experimental work reported is for the most part abstracted elsewhere in this issue.

Report of Tobacco Station at Windsor, 1925 (*Connecticut State Sta., Tobacco Substa. Bul. 6 (1926), pp. 93, figs. 24*).—The experimental work recorded is for the most part abstracted elsewhere in this issue.

Thirty-second Annual Report of [Minnesota Station, 1924, IV] (*Minnesota Sta. Rpt. 1924, pt. 4, pp. 49, figs. 11*).—Popular discussions of some of the experimental work in agricultural engineering, agricultural biochemistry, plant

pathology and botany, agricultural economics, and entomology and economic zoology are given. The experimental work reported is for the most part abstracted elsewhere in this issue.

Thirty-third Annual Report of [Minnesota Station, 1925, I], W. C. Coffey (*Minnesota Sta. Rpt. 1925, pt. 1, pp. 49*).—This contains the organization list, a report of the director on the work and publications of the station, and a financial statement for the fiscal year ended June 30, 1925.

Report of Southeast Demonstration Farm and Experiment Station, Waseca, 1919, R. E. Hodgson (*Minnesota Sta., Waseca Substa. Rpt. 1919, pp. 16, figs. 2*).—The experimental work reported is for the most part abstracted elsewhere in this issue. A financial statement for the fiscal year ended February 29, 1920, is included.

Report of Southeast Demonstration Farm and Experiment Station, Waseca, 1919–1923, R. E. Hodgson (*Minnesota Sta., Waseca Substa. Rpt. 1919–1923, pp. 36, figs. 13*).—Data corresponding to the above are reported for the five-year period 1919–1923. The experimental work is for the most part abstracted elsewhere in this issue.

Report from Holly Springs Branch Experiment Station for 1925, C. T. Ames (*Mississippi Sta. Bul. 233 (1925), pp. 28, figs. 3*).—The experimental work reported is for the most part abstracted on page 228.

Report [of] Raymond Branch Experiment Station, 1925, H. F. Wallace and C. B. Anders (*Mississippi Sta. Bul. 231 (1925), pp. 17*).—The experimental work reported is for the most part abstracted elsewhere in this issue.

Report [of] South Mississippi Branch Experiment Station, 1925, E. B. Ferris and W. S. Anderson (*Mississippi Sta. Bul. 232 (1925), pp. 16*).—The experimental work reported is for the most part abstracted elsewhere in this issue.

Forty-eighth Annual Report of the North Carolina Agricultural Experiment Station, [1925], R. Y. Winters et al. (*North Carolina Sta. Rpt. 1925, pp. 41*).—This contains the organization list, a report of the director and heads of departments, and a financial statement for the fiscal year ended June 30, 1925. The experimental work is for the most part abstracted elsewhere in this issue.

Thirty-eighth Annual Report of [Rhode Island Station, 1925], B. L. Hartwell (*Rhode Island Sta. Rpt. 1925, pp. 38–53*).—This report includes experimental work for the most part abstracted elsewhere in this issue.

Information regarding recent publications (*Kansas Sta. Circ. 124 (1926), pp. 4*).—This circular briefly describes Bulletins 235 and 236 and Circulars 112–121, previously noted, and Circulars 122 and 123, abstracted elsewhere in this issue.

Research service to the Massachusetts apple industry: Progress reports (*Massachusetts Sta. Bul. 226 (1926), pp. 9–40, pls. 2, figs. 2*).—This bulletin contains 10 papers, summarizing the more practical aspects of some of the experimental work of the station that is of interest to fruit growers and abstracted elsewhere in this issue.

The Connecticut Valley onion industry: Progress reports of experimental work (*Massachusetts Sta. Bul. 227 (1926), pp. 41–51*).—This bulletin contains four papers, summarizing the experimental work of the station which is of special value to onion growers and abstracted elsewhere in this issue.

List of manuscript bibliographies and indexes in the U. S. Department of Agriculture, including serial mimeographed lists of current literature, compiled by E. L. Ogden and E. B. Hawks (*U. S. Dept. Agr., Library, Bibliog. Contrib. 11 (1926), pp. II+38*).—This mimeographed compilation is a revision of an earlier list and contains 202 entries classified as to subject matter.

NOTES

Hawaii Station.—The station has brought about some mutually helpful contacts with the public by inaugurating numerous cooperative experiments with farmers. Probably the most popular project in this direction is the supplying of improved varieties of fruit trees and planting material of other crops, these then being grown cooperatively by the farmers to serve as neighborhood demonstrations and sources of further propagating material for local use.

Idaho University and Station.—An economic survey of Idaho agriculture is being carried on in cooperation with the State and Federal Departments of Agriculture. This survey includes studies of the general economic and physical factors influencing the development of agriculture in Idaho and of the various farm enterprises and their marketing outlets, and surveys of typical local areas with special reference to the place of the different farm enterprises in the farm organization of these typical areas. In addition to the station economist, C. F. Wells of the faculty of the School of Business Administration is assisting in the survey in the employ of the station. A conference to consider a general agricultural program for the State as indicated by the results of the survey is to be held early in September.

Nebraska University.—A. D. Weber of the Kansas College and Station has been appointed assistant professor of animal husbandry.

Pennsylvania College and Station.—The resignations are noted of C. Everett Myers as professor of agricultural education, effective August 15; D. McK. Gray and G. H. Rea, assistant professors, respectively, of poultry husbandry and apicultural extension, effective October 1; G. G. DeVault as assistant professor of agricultural economics extension, effective June 30; Paul Acquarone as instructor and assistant botanist, effective June 30; and F. B. Bennett and M. H. Cubbon, instructors, respectively, of agricultural education and soil technology, effective June 30. R. R. Welch has been appointed assistant professor of dairy husbandry extension, effective July 1; Dr. Joseph R. Haag, assistant professor of agricultural and biological chemistry, effective July 1; Clarence S. Anderson, assistant professor of agricultural education, effective September 1; Arthur B. Bingham and John U. Ruef, instructors in agricultural extension, effective July 1; H. H. Kauffman, instructor in poultry husbandry extension, effective June 15; Edwin J. Anderson and Herbert A. Wahl, instructors, respectively, in entomology extension and botany, effective September 1; and Archibald R. Judd, assistant in botany, effective September 1.

South Dakota College and Station.—A. H. Kuhlman, associate professor of animal husbandry and associate animal husbandman, and Lynn Copeland, assistant professor of dairy husbandry and assistant dairy husbandman, have resigned.

Virginia Truck Station.—The annual farmers' picnic, which has been held for a number of years in cooperation with the college extension service, took place on the station grounds August 10, about 2,000 farmers and their friends participating. Addresses were given by the governor of the State, in which he stressed among other things the importance of the station work, and by the director of the station on the experimental work now receiving attention.

EXPERIMENT STATION RECORD

VOL. 55 SEPTEMBER, 1926 No. 4

Economic research is the systematic study of the facts of economic life to determine conditions and discover causal relationships in economic phenomena. It is fair to assume that its ultimate purpose is to provide helpful guidance for economic activity. This does not exclude purposeful fact-finding from the category of research, hut it does imply that aimless compilation of data is not to be designated as research. Facts are the raw material, systematic analysis is the tool, but the search for relationships is the heart of economic investigation.

The investigator should search for facts and relationships, a knowledge of which will aid in the solution of economic problems. A science may have its beginning in truth for its own sake, but ordinarily its growth may be expected to result in truth for utility. Furthermore, the public which has so generously endowed agricultural economic research by State and National appropriations has the right to expect results of a material and social value.

Efforts to attain a high standard of research in agricultural economics bear greater promise of success if based on at least two considerations. One of these is a correct understanding of economics as compared to other fields of investigation. The other is a realization of the necessity of dividing this field into parts and formulating projects for the study of economic problems that are sufficiently specific to lend themselves to the scientific method.

From the standpoint of research there are two fundamental differences between economics on the one hand and the physical and the biological sciences on the other. First, economic life is highly complex and rapidly changing; and these characteristics become more pronounced with the growth of economic groups and their increasing interdependence, and with the expansion of the spheres of competition. Second, economic problems rarely lend themselves to study under controlled conditions. The physicist can control temperature, light, pressure, etc., but the economist must study his problem in the open where it is exposed to a multiplicity of influences that are largely beyond his control.

Recognizing the fluidity of economic problems, certain investigators show more or less reluctance to accept methods of study that have been developed in other fields of research. There is sometimes an evident inclination toward the hasty, touch-and-go method for which justification is sought on the ground that economic problems are too changeable to admit of more thorough study over a longer period. This tendency manifests itself often in agricultural economics in the form of hasty and very general surveys without any provision for later application of more refined methods to the specific problems in the field covered by the survey. Yet if an economic problem is so transitory that it will not outlive a study of more than a few months' duration, it may be of little value to study it at all except perhaps for historical purposes. The results of a study could hardly be useful in solving a problem that disappeared before the study was completed.

A realization of the complexity of economic problems often appears to result in the formulation of very broad projects. The investigator sometimes seems to think it is possible to overcome the difficulties due to complexity by making the projects so comprehensive that he cannot possibly miss any part of the problem. But, obviously, the broader the project the more difficult it is to determine separate causal relations, and the result of many all-inclusive and hasty surveys is little more than a catalog of current practices. Therefore, research work in agricultural economics is more likely to attain a high standard if each undertaking is limited as far as possible to one phase of a problem, with the objective stated specifically and the method of procedure outlined with care after the investigator has acquainted himself with the work already done in the immediate field of his problem. This approach calls for a specific project; but it does not exclude the bringing together of the results of several projects in formulating a basis for an economic program.

With the increasing availability of basic data and with the numerical growth of studies in various fields, it becomes more and more necessary to limit the scope of each investigation. At the same time, it should be recognized that certain phases of a specific project will often assume somewhat different form as the study progresses. New sources of information and new means of approach are likely to present themselves, especially to the able investigator. Therefore, the outline should not be a rigid plan from which no deviation can be made, but should represent a studied statement of the problem and a careful charting of the course which the investigation is expected to follow. The purpose is not merely to get detailed plans on paper, but rather to clarify the problem and to develop the course of procedure as fully as possible before the study is undertaken.

Such an approach is the opposite of rushing into a field of study mapped in haste and designated by an all-inclusive title, and then trusting to luck that fruitful sources of information and logical procedure will develop by and by.

The title is an important part of the project outline. It should characterize the investigation as precisely as possible. For example, it is not desirable to use the label "Marketing Farm Products" if it is proposed to make a study of the marketing of eggs. Nor is it sufficient to call it "Marketing Poultry Products" if it is to be confined to the marketing of eggs on a quality basis. If the title is definite, the nature of the study and its connection with a given problem is more apparent. Furthermore, the specific title has the added advantage of being more informative.

The objective should be stated specifically in the outline, defining clearly the reason for undertaking the study. The experiment station, or other research agency, is presumably confronted with a problem of some importance, or facing a question upon which light can be thrown by fact finding and analysis of data. Out of a painstaking attempt to state the object of such a study should come a helpful clarification of the issue.

In stating the objective, the investigator would do well to ask himself the question: "What will be the utility of this study?" While this should not be interpreted as opposed to efforts to find truth for its own sake, it should be borne in mind that the public has the right to expect research for utility when the research draws its support largely from the taxpayers. Moreover, an effort to answer the question of utility will be helpful to the investigator in formulating a promising method of procedure.

Work already done in the specified field should be indicated briefly in the project outline to show the status of the problem. The investigator should be familiar with what has been done in his State or elsewhere on the problem he proposes to study. Elementary as this seems, this requirement is often not met, especially in a rapidly growng field, such as agricultural economics. Here the demand within the past decade has made it difficult to develop an adequate corps of trained workers. Many have therefore begun independent work with little related experience and often with limited basic training. Progress in any field of investigation, however, depends upon the extent to which each new investigation builds upon the past and the extent to which it contributes new information and discovers new relationships. Failure so to build upon the past frequently means aimless wandering about in fields previously explored in the same desultory fashion.

The value of new investigations would often be greatly enhanced if the individual station should encourage and even require the

project leaders, especially those with limited experience, to devote some time to a canvass of the field before the new study is undertaken. Each project outline should contain a brief reference to the important work already completed. It should indicate that the project leader has familiarized himself with the field of his problem.

The plan of procedure should be a detailed account of the course which the investigation is expected to follow. It should not be arbitrary and rigid, but should embody the investigator's best ideas at the beginning of the study. At the same time, it should be borne in mind, as already indicated, that the nature of the problem may call for alterations of the original plan with the progress of the investigation. Notwithstanding such changes, a carefully prepared outline will give a better start than would ordinarily be had without it.

The outline of procedure has a two-fold purpose. It should encourage a careful charting of the course which the investigation is expected to follow, and thereby strengthen the investigator's own approach. It should also enable others to pass intelligently on its merits.

Prospective sources of information should be indicated in the project outline before beginning the work. The investigator should have definite ideas as to where he can get the needed information. Data bearing on certain phases of the investigation may be already available in convenient form in public records or in other tabulations made by State or Federal agencies. If so, the individual investigator would waste time and resources by attempting a new compilation of the same data. Therefore, sources should be indicated in the outline for two reasons: (1) A careful consideration of possible sources before the work is begun will save time and effort; and (2) it frequently happens that others who review the outline may be able to suggest other and more fruitful sources.

Reliable conclusions can be drawn only on the basis of an adequate amount of pertinent data gathered in such a manner as to avoid statistical bias. This means that a sufficiently large number of cases, chosen in accordance with accepted statistical standards of sampling, should be included in the study. For example, an investigation of the relation between the net rent and the selling value of land in a given locality demands that a sufficient number of farms should be studied to form the basis for reliable averages and to admit of calculation showing variations from the average. The complexity of economic investigations makes it particularly important to gather a body of data sufficiently large that the influence of minor variations due to uncontrolled conditions will be minimized in the calculations. The investigator can not rely upon the statistical regularity of large numbers to bridge the pitfalls

of minor variations unless he has an adequate body of data from which to draw his conclusions.

Although a project should be outlined carefully before the work is begun, the investigator should not become a slave to his outline. New phases will often present themselves, new sources of information may be found, or new methods of analysis devised in the progress of the study, any or all of which may call for a deviation from the original plan. This, however, presents few administrative difficulties. When a research project is begun with the approval of some administrative head, important departures from the approved outline should be submitted in the form of a supplement for comment and approval as a part of the project.

The purpose of a project outline is to raise the standard of investigation. It should do this first by defining the question to be studied and by indicating the major sources of information and specifying a procedure which will be adequate to the undertaking. In the second place, it should serve as an administrative means of carrying out a definite research policy.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Practical physiological chemistry, S. W. Cole (*Cambridge, Eng.: W. Heffer & Sons, 1926, 7. ed., rev. and enl., pp. XII+481, figs. 66*).—Although this is essentially a laboratory manual on physiological chemistry, the author has included in the present revision a chapter on biological oxidations and reductions which is largely theoretical and based upon studies at Cambridge University, including those of M. W. Onslow on the oxidase system of plants and of F. G. Hopkins on glutathione. The chapter on physical methods has been enlarged to include a description of the various methods for the measurement of H-ion concentration, including the electrical, quinhydrone, indicator, and Michaelis methods, with detailed explanations of pH, the law of mass action, and the dissociation of weak acids. A new chapter has been added on the analysis of blood.

An alcohol-soluble protein isolated from polished rice, W. F. Hoffman (*Jour. Biol. Chem., 66 (1925), No. 2, pp. 501–504*).—The author has obtained from polished rice an alcohol-soluble protein to the extent of 0.12 per cent of the original rice. On elementary analysis the protein was found to contain carbon 55.92, hydrogen 6.49, nitrogen 16.22, and sulfur 1.14 per cent. These results correspond closely to those previously reported for the prolamines for maize, kafir, etc. (E. S. R., 54, p. 801), and differ from that of wheat in a lower nitrogen and higher carbon content. The nitrogen distribution by the Van Slyke method is as follows: Ammonia N 12.45, insoluble humin N 1.65, soluble humin N 168, arginine N 13.21, histidine N 6.24, cystine N 1.33, lysine N 1.73, amino N in filtrate from bases 53.59, and nonamino N in filtrate from bases 7.32 per cent. These figures show that the protein differs from the typical prolamines in containing a lower percentage of ammonia nitrogen and a higher percentage of total basic nitrogen. The lysine content is low and the arginine content high.

The histidine and tyrosine content of a number of proteins, M. T. Hanke (*Jour. Biol. Chem., 66 (1925), No. 2, pp. 489–493*).—The histidine and tyrosine content of a number of proteins has been determined by the method noted on page 310, with the following average results for histidine and tyrosine, respectively: Gelatin 0.53 and 0.25, casein 2.61 and 4.5, crystalline egg albumin 2.3 and 2.35, squash seed globulin 2.26 and 3.05, gliadin 2.1 and 2.35, hordein 0.98 and 2.43, zein 1.25 and 3.66, secalin 1.23 and 1.37, sativin 0.74 and 1.56, sorghumin 0.51 and 2.3, fibrin (sheep) 2.18 and 3.3, fibrin (swine) 2.27 and 3.45, and fibrin (cattle) 2.05 and 3.5 per cent. In general these results agree fairly closely with those obtained by the gravimetric method, but are invaribly much lower than those obtained by the method of Folin and Denis (E. S. R., 28, p. 805), or by the bromine addition process and the Millon reaction as described by Fürth and coworkers.

Formaldehyde in certain marine products, D. B. Dill and P. B. Clark (*Jour. Assoc. Off. Agr. Chem., 9 (1926), No. 1, pp. 117–122*).—Formaldehyde, in

amounts sufficient to be readily detected by the Official potassium ferricyanide method, and in some cases by the Leach and nitroprusside tests, has been demonstrated to develop in sterile canned crustacea and so-called red rock cod. The development of formaldehyde was shown to take place in the absence of free oxygen and to be independent of the nature of the container and the processes of can corrosion and of blackening the contents from iron sulfide formation. Quantitative determinations of the formaldehyde by acidification, distillation in steam, and estimation as formic acid gave amounts varying from 1 to 20,000 in spider crabs to 1 to 30,000 in Canadian lobsters. When a definite amount of formaldehyde was added to formaldehyde-free salmon and the same method of recovery was used, only one-third of the added formaldehyde could be accounted for, thus indicating that the amounts reported were in many cases far too low.

Calcium cyanide—"powdered hydrocyanic acid": A new product of manufacture, F. J. Metzger (*Indus. and Engin. Chem., 18 (1926), No. 2, pp. 161–163*).—A method of preparing calcium cyanide in solid form from the action of liquid hydrocyanic acid containing a small amount of water upon calcium carbide is described. The materials are fed mechanically into a vacuum crystallizer, the whole process requiring from 3 to 4 hours.

The product is a light, very finely divided powder of a light tan color. It is readily soluble in water, evolving a small amount of heat, and giving Ca and CN ions. It is extremely sensitive to the moisture of the air, practically all of its HCN content being liberated in 1 minute when exposed in thin layers. It is soluble in ethyl and methyl alcohol in absolute and dilute forms. It is stable to temperatures up to about 120° C., and remains unchanged when exposed in air-tight containers for long periods of time at temperatures ranging from freezing to 60°. Both its physical and chemical properties are thought to make it a particularly suitable material for many operations hitherto involving the use of liquid HCN. Notable among these is its application as a fungicide for scale on citrus trees. Field tests indicate that it kills the scale without injury to fruit or tree at concentrations much less than the usually accepted dosages for liquid HCN. Another suggested application is for such fumigation as warehouses, ships, mills, railroad cars, etc.

The destructive action of acids, alkalies, and enzymes on insulin, H. A. Shonle and J. H. Waldo (*Jour. Biol. Chem., 66 (1925), No. 2, pp. 467–474, figs. 3*).—Continuing with larger samples the chemical examination of insulin previously noted (E. S. R., 51, p. 410), the authors have investigated the changes brought about in insulin by the hydrolytic action of acids, alkalies, and trypsin, testing samples of the material from time to time for insulin activity and for total protein nitrogen by precipitation with zinc sulfate and nonprotein nitrogen by precipitation with tungstic acid.

In every case a gradual loss of physiological activity took place simultaneously with the gradual hydrolysis of the material as judged by the nitrogen analysis. This change was irreversible. It is concluded that "insulin may be of a true protein structure, possessing specific activity, or it may consist of a chemical complex attached to a protein structure. However, when the protein is broken down into slightly smaller units, by either acid, alkali, or enzyme, the physiological functioning is lost."

A delicate colour reaction for the presence of vitamin A, O. Rosenheim and J. C. Drummond (*Biochem. Jour., 19 (1925), No. 5, pp. 753–756*).—The authors report that arsenic chloride and certain other reagents including dimethyl sulfate, trichloroacetic acid, acetyl chloride, and benzoyl chloride

(the last two only in the presence of zinc chloride) give a brilliant ultramarine blue color reaction with cod-liver oil. The test, like the sulfuric acid test previously described (E. S. R., 48, p. 758), appears to be characteristic for vitamin A, but has the advantage over the sulfuric acid test in persisting for from 5 to 10 minutes, a time sufficiently long to permit of a colorimetric comparison with a suitable standard.

The reaction with arsenic chloride consists in adding 1 cc. of pure arsenic chloride of 1 drop of cod-liver oil and shaking the test tube at once. The oil dissolves immediately to form a clear blue solution turning to purple. A well-defined absorption band extending from λ 550 to 590 is found to persist for about 5 minutes. The limit of sensitivity to the test was reached with a dilution of cod-liver oil containing 0.05 mg. of the oil, the test showing a sensitivity 20 times as great as that of the sulfuric acid test. The cholesterol-free fraction of saponified cod-liver oil gave the reaction in a dilution of 1:2,000,000, but irradiated cholesterol gave a negative test, suggesting the possibility of differentiating vitamin A from the antirachitic vitamin by this test.

In the application of the test to the quantitative estimation of vitamin A, preliminary experiments have shown that even a rough colorimetric comparison with a suitable standard yields results of greater accuracy than those obtainable by the laborious animal feeding tests. "We have so far made use of the arsenic chloride and the trichloroacetic acid reaction, and have taken as our standard of vitamin A a highly active Newfoundland oil. A suitable color standard for the arsenic chloride reaction is a mixture of 100 cc. crystal violet solution (1:10,000) with 50 cc. methylene blue solution of the same strength (both in alcohol). Under the conditions chosen we found that the color produced by 20 mg. of the oil (=1 drop from a pointed glass rod of 3 mm. diameter) + 1 cc. $AsCl_3$ matches the standard dye solution diluted in the proportion 3:2."

On the technique of testing for the presence of vitamin A, J. C. DRUMMOND, K. H. COWARD, and J. HANDY (*Biochem. Jour., 19 (1925), No. 6, pp. 1068–1074, figs. 3*).—A modified technique for testing for vitamin A by the usual feeding experiments with young rats is described which takes into consideration the necessity for antirachitic vitamin and the complication resulting when the source of this vitamin is not entirely distinct from vitamin A.

The basal ration consists of purified caseinogen 15, pure rice starch 70, yeast extract 5, salt mixture 5, and lemon juice 5 parts. This is supplemented from the beginning of the experiment with 1 mg. daily of irradiated cholesterol administered separately in the form of 1 drop of a solution in liquid paraffin. Typical growth curves of animals during the preliminary period on the basal diet are given. These are considerably steeper and longer in the growth phase than those obtained with the basal diet unsupplemented by vitamin D. Growth continues for 5 or 6 weeks, after which there is a sudden and rapid decline in place of the usual stationary period.

It is noted in commenting upon the extra length of time required to complete the test with the new technique that the sensitivity and reliabiliy of the color test of Rosenheim and Drummond (see above) seems to be of about the same order as the animal test if trichloroacetic acid or dimethyl sulfate is used, and that the reaction with arsenic trichloride is decidedly more delicate.

Antiricketic substances.—II, The action of n-butyl nitrite on activated cholesterol and the antiricketic vitamin, C. E. BILLS (*Jour. Biol. Chem., 66 (1925), No. 2, pp. 451–457*).—In an attempt to determine whether irradiated

cholesterol is identical with the antirachitic constituent of cod-liver oil, the author, with the cooperation of F. G. McDonald, has applied to activated cholesterol the reaction with nitrous fumes previously described (E. S. R., 54, p. 8) as inactivating the antirachitic vitamin of cod-liver oil.

In place of using sodium nitrite and acetic acid as the source of the oxides of nitrogen, *n*-butyl nitrite was used as it is completely miscible with oil and can be measured accurately. The technique consisted in feeding young rats kept in a dark room lighted only by ruby lights the McCollum rickets-producing diet 3,143 until severe rickets developed (18 days). The materials to be tested were then incorporated in the basal diet by trituration at a definite percentage by weight. The feeding was continued for 7 days, after which the animals were killed and tested for rickets by the line test. Five rats weighing at least 50 gm. each were used for each test, and the records were discarded of all which lost weight during the 7-day period or which ate less than 2 gm. food in any 1 day or 3 gm. per day for the 7-day period.

Distinct to complete healing of rickets resulted on the addition of 4 per cent cod-liver oil to the rickets-producing diet, advanced healing with ¼ per cent cod-liver oil, advanced to complete healing with 4 per cent cod-liver oil heated for 1 hour with or without the addition of *n*-butyl nitrite in the proportion of 1 cc. to 8 gm. of cod-liver oil, and no healing with 4 per cent cod-liver oil and *n*-butyl nitrite kept in the cold for 95 hours or heated for 1 hour. Similar tests with seal oil showed no curative action of the seal oil alone or with inactivated cholesterol, and slight curative action with 4 per cent seal oil plus $\frac{1}{10}$ per cent irradiated cholesterol. In a final test negative results were secured with 4 per cent cod-liver oil and $\frac{1}{10}$ per cent irradiated cholesterol heated with *n*-butyl nitrite for 1 hour.

"The above reactions support, but do not prove, the hypothesis that the antiricketic vitamin is identical with the antiricketic derivative of cholesterol produced by irradiation."

The antiscorbutic fraction of lemon juice, III, S. S. Zilva (*Biochem. Jour., 19 (1925), No. 4, pp. 589–594*).—In this continuation of the investigation previously noted (E. S. R., 52, p. 710), it was demonstrated that while basic lead acetate precipitates the antiscorbutic fraction of lemon juice and swede juice neutral lead acetate does not. Concentrated antiscorbutic fractions prepared as previously described were found always to contain small quantities of amino and amide nitrogen. The amide nitrogen was definitely proved to have no connection with the antiscorbutic properties, but it has not yet been determined whether or not the amino group has any bearing on the action.

A note on the basal vitamin B-free diet of Drummond and Watson, A. L. Bacharach (*Biochem. Jour., 19 (1925), No. 4, pp. 638–640, fig. 1*).—The substitution of lemon juice for orange juice in the basal diet for vitamin B studies recommended by Drummond and Watson (E. S. R., 48, p. 12) is considered to have the same objection as that advanced for the use of orange juice, i. e., the introduction of a small amount of the vitamin being studied. Typical growth curves are given showing that rats on the basal diet without lemon juice cease growing more quickly than on the same diet with lemon juice and recover quite as readily following the introduction of a vitamin B-containing food.

A continuous dialysis or extraction apparatus which operates at reduced pressure with a constant volume of liquid, M. T. Hanke and K. K. Koessler (*Jour. Biol. Chem., 66 (1925), No. 2, pp. 495–499, fig. 1*).—A diagram is given, with detailed description, of an apparatus which can be used for continuous dialysis or extraction at any desired temperature below the boiling point of

The chemistry and technology of paints, M. Toch (*New York: D. Van Nostrand Co., 1925, 3. ed., rev. and enl., pp. X+413, figs. 112*).—As stated in the original preface, "this volume is intended for the student in chemistry who desires to familiarize himself with paint, or the engineer who desires a better knowledge of the subject, or for the paint manufacturer and paint chemist as a work of reference."

METEOROLOGY

Monthly Weather Review, [March–April, 1926] (*U. S. Mo. Weather Rev., 54 (1926), Nos. 3, pp. 85–131, pls. 15, figs. 9; 4, pp. 133–189, pls. 12, figs. 19*).—In addition to detailed summaries of meteorological and climatological data and weather conditions for March and April, 1926, and bibliographical information, notes, abstracts, and reviews, these numbers contain the following contributions:

No. 3.—Precipitation in the Drainage Area of the Great Lakes, 1875–1924 (illus.), by P. C. Day (see below); The Allegheny River Ice Gorge, Winter of 1926 (illus.), by W. S. Brotzman; and Thomas Jefferson on the Climate of Virginia.

No. 4.—Climatological Data for the West Indian Islands (illus.), by W. W. Reed; Precipitation Versus Snow Surveys for Predicting Stream Discharge, by J. C. Alter (see below); Whirlwinds at Oil-Tank Fire, San Luis Obispo, Calif. (illus.), by J. E. Hissong; Aerological Evidence as to the Causes of Tornadoes (illus.), by B. M. Varney; and The National Elimination Balloon Race from Little Rock, Ark., April 29, 1926 (illus.), by J. A. Riley.

Effective rainfall, J. D. Schonken (*So. African Jour. Sci., 22 (1925), pp. 96–103, figs. 2*).—Factors determining effective rainfall, such as evaporation, run-off, and drainage, are briefly considered.

Precipitation versus snow surveys for predicting stream discharge, J. C. Alter (*U. S. Mo. Weather Rev., 54 (1926), No. 4, pp. 160, 161*).—"This paper is the result of an inquiry as to the comparative value of precipitation records and snow surveys for predicting the flood-time discharge of Big Cottonwood Creek, one of the major sources of Salt Lake City's water supply. The inquiry has resulted rather decidedly in favor of precipitation records where they are available in proper numbers and places, though the snow survey shows a valuable correlation factor." It is pointed out, however, that "snow measurement sites or stations, like precipitation stations, should be regarded as indicators only; though where their locations are suitable, very good results may be obtained. Furthermore, where there is a scarcity of precipitation records or the tenure of precipitation stations is insecure, the snow survey is, in most watersheds, a convenient and satisfactory substitute."

Precipitation in the drainage area of the Great Lakes, 1875–1924, P. C. Day (*U. S. Mo. Weather Rev., 54 (1926), No. 3, pp. 85–106, figs. 9; abs. in Bul. Amer. Met. Soc., 7 (1926), No. 5, p. 69*).—Calling attention to the persistent lowering of the water levels in the Great Lakes during recent years, it is stated that the Weather Bureau's study of the subject has indicated that the removal of the forest cover, the drainage of swamps, and the cultivation of the soil has not had any measurable effect in bringing about this result.

"The precipitation was unusually heavy, on the average, from 1875 to 1885, and the period 1875 to 1899 shows more precipitation at almost every station than the period 1900 to 1924. . . . From 1917 to the present nearly the whole area has had decidedly scanty precipitation. It is not believed that removal of the forest cover has materially affected the amount of water reaching the lakes. The water levels seem to be closely related to the quantity of precipitation, delays of a year or more often appearing in the response of the levels, since

the run-off is not immediate. It is highly improbable that the deficient falls of recent years indicate permanent or semipermanent establishment of scanty supplies of precipitation. A return over several years to the normal quantity of precipitation or to even greater amount may be expected to end the present prevalence of unusually low levels in the lakes."

Climatic changes, G. C. Simpson (*Nineteenth Century, 99 (1926), No. 587, pp. 129–141; abs. in Nature [London], 117 (1926), No. 2935, p. 172*).—Discussing especially Brückner's theory of periodic (35-year) alternation of groups of cold and warm years, Wegener and Köppen's theory of continental drift as affecting climate, and the conclusions of Gregory, the author concludes that "since the beginning of geological time there has been little or no change in the mean temperature of the earth. Throughout the whole period there have been climatic belts similar to those existing at present." However, while there have been no permanent climatic changes, there have been small variations from the normal, as indicated by the Brückner theory.

Does the solar heat stream vary? F. J. W. W[hipple] (*Nature [London], 116 (1925), No. 2925, pp. 754–756*).—Reviewing discussions of this subject by Abbot, Clayton, Hoxmark, Marvin, and Kimball, previously noted (E. S. R., 53, p. 812; 54, pp. 114, 115), the author concludes that the reality of the recorded day-to-day fluctuations in solar radiation is problematical, as is the reliability of weather forecasts based upon them.

***Note on the apparent regularity of the occurrence of wet and dry years* in South-West Africa,** R. J. Van Reenen (*So. African Jour. Sci., 22 (1925), pp. 94, 95*).—Certain periodicities apparently coinciding with the Brückner cycle are indicated.

Climatological data for the United States by sections [March–April, 1926] (*U. S. Dept. Agr., Weather Bur. Climat. Data, 13 (1926), Nos. 3, pp. [200], pls. 4, fig. 1; 4, pp. [187], pls. 4, fig. 1*).—These numbers contain brief summaries and detailed tabular statements of climatological data for each State for March and April, 1926.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. Ostrander, J. Bower, jr., and H. W. Wheeler (*Massachusetts Sta. Met. Buls. 449–450 (1926), pp. 4 each*).—The usual summaries and notes are given of observations at Amherst, Mass., during May and June, 1926.

Weather conditions and crops, C. G. Selvig (*Minnesota Sta., Crookston Substa. Rpt. 1924, pp. 12–14*).—Records of observations on temperature, precipitation, cloudiness, and length of frost-free period at the Northwest Experiment Station at Crookston, Minn., are summarized, and the character of the season of 1924 as affecting crops is discussed.

The average annual temperature was 44.5° F. as compared with the 10-year average of 46.7°. A maximum temperature of 93° occurred in August and a minimum of −36° in January. The annual precipitation was 20.86 in. as compared with the 10-year average of 18.44 in. The lack of snow was unfavorable to winter grains and resulted in an unusual amount of winterkilling of rye. The frost-free period extended from June 6 to September 5.

Meteorological observations, A. Bisserup (*Virgin Islands Sta. Rpt. 1925, pp. 1, 16, 17*).—A summary by months is given of observations on temperature, rainfall, evaporation, and velocity of the wind at the experiment station on St. Croix, for the year ended June 30, 1925. The maximum temperature for the year was 92° F. June 2; the minimum 55° February 5. The rainfall for the year was 56.13 in., about 10 in. above the normal. The excessively dry weather which had prevailed during the four previous years was broken by the copious rainfall, and conditions were much more favorable for crop production.

SOILS—FERTILIZERS

Extraction of soil samples from a field [trans. title], H. HÄHNE (*Ztschr. Pflanzenernähr. u. Düngung, 5 (1926), No. 1, Wirtschaft.-Prakt., pp. 24-31*).—Studies conducted at the University of Jena are reported which showed that fields usually considered quite uniform may actually vary quite widely. Owing to the numerous possible reasons for the wide variability of the soils of a field, it is concluded that judgment should be based upon average samples rather than upon number of samples. Ten samplings gave the same average results as a greater number of samplings in all cases except on large areas, where 15 samplings gave a better indication of average composition. In all cases where fields were found to be nonuniform in composition, a higher or lower average value of the composition was apparently without significance in judging the field.

The soil survey—what it is—its uses, W. T. CARTER (*Texas Sta. Spec. Circ., Feb., 1924, pp. 16, figs. 12*).—A brief outline is presented of the nature and purpose of the Texas soil survey, most of which is made in cooperation with the U. S. D. A. Bureau of Soils.

Soil survey of Pulaski County, Arkansas, E. B. DEETER ET AL. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1922, pp. IV+721-785, pl. 1, fig. 1, map 1*).—This survey, made in cooperation with the Arkansas Experiment Station, deals with the soils of an area of 498,560 acres in central Arkansas. It consists of three principal topographic divisions, namely, the Arkansas River and its tributary stream bottoms and terraces, the highlands or hilly to mountainous country, and the rolling lands of the Coastal Plain. While the county is generally well drained, poor drainage occurs in some of the larger creek bottoms, in flat valley areas, in the flat parts of the Coastal Plain, and on some second bottoms and low areas in the Arkansas River bottoms.

Including rough stony land, river wash, and meadow, 56 soil types of 26 series are mapped, of which the Talladega stony silt loam (steep phase) and the Hanceville stony loam (steep phase) cover 14.3 and 10.5 per cent of the area, respectively.

Soil survey of Clarke County, Iowa, A. M. O'NEAL and C. B. BOATWRIGHT (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1923, pp. III+24, fig. 1, map 1*).—This survey, made in cooperation with the Iowa Experiment Station, deals with the soils of an area of 273,920 acres in south-central Iowa. The county consists of belts of rolling to strongly rolling lands along streams and level to undulating intervening areas on the divides. It is stated that a moderately complete drainage system has been developed. Along the streams where the relief is more pronounced drainage is excessive, and throughout the broader flatter divides it varies from poor to moderately good.

The county is situated in the southern Iowa loess area, and the soils have been formed through the weathering of the loess and drift materials. They are grouped into losessial, glacial, terrace, and bottom soils. Eight soil types of 8 series are mapped, of which the Shelby loam and Grundy silt loam cover 42.2 and 41.6 per cent of the area, respectively.

Soil survey of Iowa—Dallas County, W. H. STEVENSON, P. E. BROWN, ET AL. (*Iowa Sta. Soil Survey Rpt. 39 (1926), pp. 79, pl. 1, figs. 9*).—This survey deals with the soils of an area of 376,960 acres lying partly in the Wisconsin drift soil area and partly in the southern Iowa loess area in central Iowa. The surface of the county as a whole has a general incline toward the southeast. There are two distinct topographic divisions, namely, the glaciated area covering approximately the northern three-fourths of the county and the silty loess covered area occupying the southern one-fourth. The drainage conditions in

the southern part of the county are generally quite satisfactory. In the northern part, however, drainage is frequently inadequate.

The soils are grouped as drift, loess, terrace, and swamp and bottomland soils. The drift soils cover 78.6 per cent of the area. Including muck and peat, 31 soil types of 16 series are mapped, of which the Carrington loam and Webster clay loam drift soils cover 43.1 and 13.6 per cent of the area, respectively.

The results of laboratory, field, and greenhouse tests to determine the fertility requirements and crop adaptations of the prevailing soil types are summarized. These indicate that the great majority of the soils are acid in reaction and in need of lime, and that the more extensive soils are well supplied with organic matter. The content of phosphorus is generally low, and while the nitrogen content is usually adequate, in a few cases the soils are deficient in this constituent.

The procedure followed in the soil survey of Iowa is outlined in an appendix.

The water content of certain soil types in Michigan, J. O. Veatch (*Michigan Sta. Quart. Bul., 8 (1926), No. 4, pp. 198, 199*).—Data on the water content in three soil types in Michigan, with a comparison of the moisture content in two soil types under forest, are briefly presented. These indicate that a considerable difference may exist in the moisture content of the well-drained sandy soils of the State, that at certain times the water content may be as low as 1.5 per cent in certain horizons of the Grayling sand, and that the maximum amount of water in this soil is relatively low. The data also suggest that for all of the soil types tested the water content is fairly constant at depths of from 3 to 5 ft., and that very little of the summer precipitation penetrates to these depths. The greatest fluctuation in the amount of water appears to be in the surface horizon.

Utilization of the soils in the Gilroy region, S. W. Cosby (*Hilgardia [California Sta.], 1 (1926), No. 18, pp. 455–478, pls. 2, figs. 11*).—This study deals with the extent of the correlation of the crops and the soil types in that part of the Santa Clara Valley in California which extends from the vicinity of Coyote southeasterly to Gilroy and from the lower slopes of the Diablo Range in the east to the foothills of the Santa Cruz Mountains in the west. The data indicate that definite correlations exist between the various types of soil and the crops occurring in the region, and that the distribution of the major crops has been determined by soil variation.

[Soil physics studies at the California Station] (*California Sta. Rpt. 1925, pp. 65, 66*).—Investigations of the physical composition of fine-textured soils by the Odén apparatus are said to have developed a fundamental difficulty in the method. Careful measurements of the particles accumulating on the balance pan and the bottom of the cylinder showed that only from 75 to 90 per cent of the material that should fall on the pan actually accumulates there. This appears to be due to flocculation of the particles adjacent to the walls of the containing vessel, temporarily decreasing the concentration and causing further dispersal of the remaining particles in that horizon. This results in a diagonal path of fall, with a heavier accumulation on the bottom adjacent to the walls of the cylinder than in the center. No means of overcoming this action has as yet been developed.

Studies on the movement and distribution of water in soils have shown the existence of a normal moisture capacity and a maximum moisture capacity, representing the minimum and maximum amounts of water retained by the soil when the water is applied at the surface and is free to move downward through the soil mass. At normal moisture capacity the soil water is readily

available to plants but is not free to move under normal film forces, while at maximum moisture capacity the water is free to move under film forces, and its distribution is comparable to the upper portions of a capillary rise distribution.

Covering the surface of soil with a paper mulch was found to give an average increase in temperature of 0.42 degree hour per hour for a period of 15 weeks, as compared with bare soil. During 8 weeks the covered plat was warmer, while during 6 weeks the bare plat was warmer, and during 1 week both were of the same average temperature. Crops of beans, milo maize, and potatoes all were best on bare plats.

Evaporation power of soil [trans. title], A. G. Doĭarenko (*Nauch. Agron. Zhur.* (*Jour. Landw. Wiss.*), *1* (*1924*), *No. 5–6, pp. 339–349, figs. 4*).—In a contribution from the Moscow Agricultural Academy a method and apparatus for determining the evaporation power of soil are described, and studies on the influence of soil cultivation on evaporation are reported.

The method determines the amount of moisture removed from a unit of soil surface per unit of time by a current of dry air. Harrowing of black fallow in the spring was found to decrease evaporation about 20.7 per cent, plowing about 50 per cent, and maintenance of black fallow about 59 per cent.

The effect of a paper mulch on soil temperature, C. F. Shaw (*Hilgardia* [*California Sta.*], *1* (*1926*), *No. 15, pp. 341–364, figs. 16*).—In these studies covering with an asphalt coated paper increased the mean temperature of soil by an average of about 0.42° per hour. The covered plats were warmer 62.5 per cent of the time, the bare plats 28.3 per cent of the time, and the temperatures of the two plats were the same about 9 per cent of the time. The covering hastened the time of warming, retarded the rate of cooling, and gave a narrower range between the maximum and minimum temperatures, with a resulting more uniform temperature condition. The covering modified the delay in reaching maximum or minimum soil temperatures. The need was emphasized for continuous records in any soil temperature studies where differences in treatment or shading may occur.

Soil moisture losses from the upper 18 in. were reduced to an appreciable extent by the paper covering, much of the loss from the bare plat apparently being due to the drying out of the upper 6 in. The water present at the end of the experiment was still above the wilting point, and there was no moisture deficiency in either plat. The yields with milo, beans, and potatoes indicated that the covering was of no benefit to any of these crops, the figures actually indicating an adverse effect.

The results are taken to indicate that, while the use of the paper mulch cover may conserve the moisture to some extent, there is no indication that it will favorably affect the growth of crops under such climatic conditions as exist in Berkeley.

[Soil solution studies at the California Station] (*California Sta. Rpt. 1925, p. 57*).—Soil solution studies carried out on soils from different parts of California for 10 years indicate that the decrease in crop production has been accompanied by a very definite loss of ability on the part of the soils to produce or maintain adequate concentrations of nitrate, phosphate, and potassium in the soil moisture. Special soil solution studies have indicated the importance of nitrification in its relation to the availability of other essential elements.

Contributions to the question concerning the factors which determine reaction of the water extracts of soil [trans. title], E. V. Bobko and Druzhinin (Droujinin) (*Trudy Nauch. Inst. Udobr.* (*Trans. Inst. Fert.* [illegible]), *No. 27* (*1925*), *pp. 77*).—Studies on the reaction and chemical composition of water extracts and solutions of limed and unlimed soils and peat are

reported, the purposes being (1) to determine the influence of variations in the proportions of water and soil on reaction, (2) to investigate the relations existing between the reaction of the soil extract and that of the soil solution, and (3) to investigate the changes in the reaction of acid soils after the application of lime.

It was found that the H-ion concentrations of both limed and unlimed soils varied relatively slightly with changes in the proportion of water to soil. Carbon dioxide in the distilled water had no influence upon the pH value of unlimed soils, but it tended to increase the pH value of limed soils slightly. A comparison of the reactions of soil solutions and of water extracts of soils showed considerable discrepancies in three cases and only small discrepancies in nine cases. In all cases of limed soils the pH value of the soil solution was greater than that of the water extract.

A close relation between pH and general alkalinity existed in limed and unlimed soils taken from pots and from the field. Calcium was usually present in limed soils in proportion to the bicarbonate ion. The departures from this equivalence were uniform to a certain extent; in the pot soils the calcium predominated while the bicarbonate predominated in the field soils.

Pot experiments showed that an increase in the lime application to a soil increased the amonnt of organic matter in the water extract. On the other hand, in field experiments a relatively constant proportion of humus was observed in the water extract. Repeated washings of limed and nulimed soils apparently caused small but regular changes in reaction with certain exceptions.

A comparison of the pH values obtained experimentally from the extracts of limed soils and of computed pH values led to the conclusion that the buffer system in the water extracts of these soils consists of a mixture of carbonic acid with a bicarbonate. Further experiments showed that the amount of carbonic acid determined by weight is equal to the amount of carhonic acid determined hy titration.

Free carbonic acid in the water extract of unlimed podsol soils and peat was found to exert almost no influence upon the reaction of the water extracts. On the other hand, the removal of the free carbonic acid from the water extracts of limed soils changed the reaction. In these cases the results are taken to indicate that the reaction depends upon the relation of the carbon dioxide of carbonates and of that of bicarhonates in solution.

All of the unlimed podsol soils, raw humus, peat, and a series of soils containing comparatively little organic matter showed a marked discrepancy between the pH values determined colorimetrically and those calculated by formula. An attempt is made to explain this finding.

An English summary is appended.

Influence of individual factors on the reaction of the soil solution [trans. title], E. W. Bobko and D. W. Druschinin [Druzhinin] (*Ztschr. Pflanzenernähr. u. Düngung, 5 (1925), No. 6, Wiss., pp. 345–369*).—Studies of the H-ion concentration of soil extracts and of soil solutions are reported which were conducted at the Moscow Agricultural Academy.

The relative proportions of soil and water had only an insignificant effect on the H-ion concentrations of water extracts from limed and unlimed soils. In the case of unlimed soils an increase in the amount of water used caused an insignificant decrease in the H-ion concentration. The opposite occurred in limed soils.

The variations between the H-ion concentrations of water extracts and those of soil solutions did not exceed 0.3 pH in most cases. The H-ion concentration of the solution of limed soils was always greater than that of the water extract. The opposite was true for unlimed soils.

Analyses of a large number of soils showed a constant relation between titration alkalinity and H-ion concentration. The pH value of the water extract increased as the titration alkalinity increased. The H-ion concentrations of a series of successive washings from a soil were approximately constant. The experimentally determined H-ion concentrations of water extracts of limed soils and those estimated by the formula

$$[H]=\frac{[CO_2]}{[HCO_3]}\times 3.10^{-7} \qquad (1)$$

corresponded quite closely. The H-ion concentration of these extracts is therefore regulated by the buffer system CO_2+HCO_3.

The free carbon dioxide in the water extracts from a series of unlimed podsol soils and peats had practically no influence on the H-ion concentration of these extracts. On the other hand, the separation of the carbon dioxide from extracts of limed soils resulted in an important increase in the pH values. The buffer system CO_2+HCO_3 is therefore changed into the system HCO_3+CO_3, and the formula

$$[H]=\frac{[HCO_3]}{[CO_3]}\times 0.10^{-11} \qquad (2)$$

applies for the estimation of the H-ion concentration from the titration values. The results obtained with this formula were found to correspond closely with those obtained experimentally.

A considerable difference was found between the H-ion values estimated according to formula (1) and those determined experimentally for all unlimed podsol soils, raw humus, peat, and some limed soils which were rich in humus.

An extensive bibliography is appended.

Exchange acidity of soils and the relation between titration and actual acidity [trans. title], H. Niklas and A. Hock (*Ztschr. Pflanzenernähr. u. Düngung, 5 (1925), No. 6, Wiss., pp. 370–392, figs. 10*).—Tabular and graphic data on the subject are brought together from different sources and discussed, and some original data are reported. Apparently no specific conclusions are drawn.

[Soil carbon dioxide], E. H. Reinau (*Technik Landw., 5 (1924), No. 10, pp. 182–196, figs. 7*).—An analytical discussion of soil carbon dioxide, with particular reference to its physical and other functions in the soil in connection with the growth of specific crops, is presented.

A year of observations indicated that nine-tenths of the carbon dioxide produced in soil escape during the time of the main growth of crops. The importance of water in the correct transformation of soil energy and in soil respiration is emphasized. The frequent marked stimulation of plant growth following a light rain is attributed to increased soil respiration.

Adsorbed aluminum in soil [trans. title], A. Sokolov (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 1 (1924), No. 5–6, pp. 411–418*).—Studies conducted at the Engelhart Experiment Station in Russia are reported which showed the presence of appreciable quantities of adsorbed aluminum in podsol and moor soils. This material is considered to be one of the factors which produce an unsaturated acid condition in soils. It is concluded that the determination of the degree of unsaturation of a soil by titration of a barium chloride extract must include a determination of the adsorbed aluminum.

[Soil alkali investigations at the California Station] (*California Sta. Rpt. 1925, pp. 49, 50*).—A continuation of alkali investigations by E. E. Thomas and W. P. Kelley has indicated that the use of sulfur is an effective and economical treatment for alkali land.

Studies by Kelley and S. M. Brown of a large number of alkali soils from many localities indicate that alkali soils in general may be classified as (1) those which contain high concentrations of soluble sodium salts and are deficient in soluble calcium salts, (2) those with high concentrations of soluble sodium salts but containing considerable soluble calcium, and (3) soils with a high content of water soluble calcium salts. Drainage is considered to be of primary importance in the reclamation of all of these soils.

The reaction between calcium sulphate and sodium carbonate, and its relation to the reclamation of black alkali lands, J. F. Breazeale and P. S. Burgess (*Arizona Sta. Tech. Bul. 6 (1926), pp. 123–139*).—Studies are reported which indicate that sodium carbonate and calcium sulfate may exist together in the same soil solution up to a concentration of approximately 25 parts per million of the former. It was found that in applying gypsum as a corrective for black alkali to soils that contain no free carbon dioxide the amount of black alkali may be reduced to about 25 parts per million in the soil solution, but no lower. Soils that contain black alkali were found to contain no free carbon dioxide.

It is considered advisable to leach the soil after an application of gypsum as a corrective for black alkali in order to remove the soluble salts. It is considered also advisable to apply organic matter and to cultivate.

Peat and peat problems in Sweden, S. Odén (*Fuel, 4 (1925), No. 12, pp. 505–527, figs. 17*).—In a contribution from the Royal Institute of Technology, Stockholm, an account is given of the present status of scientific and technical research in Sweden with regard to peat and peat problems, special attention being drawn to the use of peat as a fuel and as an agricultural soil.

Soils weathered from parent rock [trans. title], H. Niklas and A. Götting (*Landw. Jahrb. Bayern, 16 (1926), No. 4–5, pp. 143–148*).—Studies of the composition and biological characteristics of certain Bavarian soils weathered directly from granite and gneiss are briefly reported. The results showed that a rather large percentage of such soils, especially meadow soils, do not contain Azotobacter.

Method of microbiological investigations of soil [trans. title], E. V. Dianova, A. A. Voroshilova, and N. N. Khudiakova (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 1 (1924), No. 7–8, pp. 487–502, fig 1*).—In a contribution from the Moscow Agricultural Academy a method of investigating the influence of cultivation and other treatments on the bacterial processes of soils is described. This is a soil-sand culture method, using solid nutritive media consisting of sterile washed sand, soil, and nutritive solution.

By use of this method a definite retarding action of soil extracts and soil solutions on the bacterial processes of some soils was noted. The introduction of soil solution into the culture sometimes depressed the bacterial activity as much as 50 per cent. This action varied with the time of year. Special treatment of the soil solution such as sterilization, ventilation, or mixing with carbon markedly reduced its toxic properties.

Method of counting the bacteria in the soil according to their physiological groups [trans. title], A. S. Razumov (Razoomov) (*Trudy Nauch. Inst. Udobr. (Trans. Inst. Fert. [Moscow]), No. 28 (1925), pp. 20*).—A method of determining standards for the physiological groups of soil bacteria, including especially the nitrogen modifying bacteria, is described.

By the use of this method it was found that the numbers of Azotobacter in the fields about Moscow vary from 0 to 40,000 per gram of soil. In other experimental fields the Azotobacter were found to vary from 0 to 800 per gram of soil, nitrifying bacteria from 40,000 to 100,000, and denitrifying bacteria from 40,000 to 600,000.

Liming and the simultaneous addition of lime and manure increased the numbers of Azotobacter and nitrifying bacteria. The numbers of denitrifying bacteria also increased in most cases as a result of liming. Soils rich in lime and organic matter were found to contain a typical strain of Azotobacter, while in others a feebly pigmenting strain was often encountered. The numbers of Azotobacter were found to be comparatively small during September and November, while in December these organisms were found in the same numbers as occurred during the first half of the summer.

Predominance of the activity of anaerobic nitrogen fixing bacteria in soil [trans. title], G. Truffaut and N. Besszonoff (*Compt. Rend. Acad. Sci. [Paris], 181 (1925), No. 3, pp. 165–167*).—Studies are briefly reported in which it was found that the bacterial fixation of atmospheric nitrogen under anaerobic conditions was almost double that under aerobic conditions. These results are taken to indicate the importance of using caution in estimating the activities of Azotobacter and other aerobic soil organisms in the fixation of nitrogen.

Critical study of the Neubauer seedling method [trans. title], E. Günther (*Ztschr. Pflanzenernähr. u. Düngung, 5 (1926), No. 1, Wirtschaft.-Prakt., pp. 32–36*).—A critical study of the Neubauer seedling method for determining the availability of soil nutrients is briefly reported.

The results showed that the seedlings removed the same quantities of phosphoric acid and potash from soil in spite of varying soil reactions. It is concluded that variations in soil reaction have no influence on the assimilation of soil nutrients by seedlings if the effect of the reaction is not too severe. For this reason the method is considered to be rapid and safe for estimating the supply of available phosphoric acid and potash in a soil.

Soil productivity as affected by crop rotation, W. W. Weir (*U. S. Dept. Agr., Farmers' Bul. 1475 (1926), pp. [1]+22, figs. 13*).—Practical information on the subject is presented.

Connecticut soils and their response to fertilizers (*Connecticut State Sta. Bul. 274 (1926), pp. 201, 202, fig. 1*).—Chemical studies of nearly 100 samples of soil are briefly summarized.

The Illinois soil experiment fields, F. C. Bauer and R. S. and L. H. Smith (*Illinois Sta. Bul. 273 (1926), pp. 38–327, figs. 45*).—The purpose of this bulletin is to describe the work on each of 56 soil experiment fields, distributed over the State of Illinois on various soil types, and to report the results obtained to date. These results for each field are presented in considerable detail.

Soil fertility and soil management experiments, C. G. Selvig (*Minnesota Sta., Crookston Substa. Rpt. 1924, pp. 35–45*).—The progress results of 7 experiments in soil fertility and soil management are briefly summarized (E. S. R., 53, p. 119). These include continuous cropping with the same crop without the use of manure or fertilizer or the growing of a legume; a 4-year rotation of wheat, oats, barley, and cultivated crops without manure, fertilizer, or legume; a 4-year rotation of wheat, clover, oats, and cultivated crops, using manure and phosphates, singly and in combination; a 3-year rotation of barley, clover, and cultivated crops, with manure and various fertilizer con-[illegible]tituents; the use of different amounts of manure in a 4-year rotation of [illegible]eat, clover, oats, and cultivated crops; the use of different quantities of [illegible]t straw in a 2-year rotation of wheat and a cultivated crop; and a 2-year [illegible]on of wheat and cultivated crops on fall plowed, spring plowed, and [illegible] land.

[Soil [illegible]tility studies at the Texas Station] (*Texas Sta. Rpt. 1925, pp. 25, [illegible]*).—Data from rotation, soil improvement, and soil moisture and [illegible]rvation experiments are briefly reported. The results of 10

years' work are said to show that the use of green manure and of fallow has not paid, and that probably the alternation of cotton with grain sorghums is the most practical cropping system to use in northwest Texas. In general, rotation has produced considerably larger yields than continuous cropping to one crop.

Experiments on the composting of raw phosphate rock and sulfur showed that sulfur as a fertilizer has no significant effect on the yields of corn, cotton, and oats, and that it is not needed as a fertilizer on the heavy black limestone soils of central Texas.

Experiments on the use of sewage sludge as a fertilizer showed that corn made very little gain over untreated plats when the sludge was applied at rates of from 500 to 2,000 lbs. per acre, both alone and in combination with 200 lbs. of acid phosphate. Cotton fertilized with sewage sludge showed a gain of from 15 to 20 per cent over the untreated plats when the sludge was applied at rates of from 500 to 2,000 lbs. per acre, both alone and in combination with 200 lbs. of acid phosphate. The plats receiving applications of from 1,500 to 2,000 lbs. of sludge per acre and those receiving 1,000 lbs. of sludge in combination with 200 lbs. of acid phosphate produced the highest yields.

The economic value of farm manure as a fertilizer on Iowa soils, W. H. Stevenson, P. E. Brown, L. W. Forman, et al. (*Iowa Sta. Bul. 236* (*1926*), *pp. 219–245, figs. 2*).—The results are brought together and analyzed of a number of experiments on the use of farm manure on different Iowa soils which indicate that the economic value of farm manure used as a fertilizer on Iowa soils is $1.97 per ton. It is estimated that over 95,000,000 tons of manure are produced in Iowa each year. Losses from manure due to improper storage and handling are said to amount to about one-half its value on the average, and in many cases up to three-fourths of its value.

***Availability* of the phosphoric acid of raw phosphates and the lime-phosphoric acid factor** [trans. title], S. Rozanov (*Nauch. Agron. Zhur.* (*Jour. Landw. Wiss.*), *1* (*1924*), *No. 7–8, pp. 503–510*).—Studies conducted at the Moscow Agricultural Academy with twelve different crops in sand cultures are reported.

The results showed that the ratio of calcium oxide to phosphoric acid in the ashes of the different crops receiving a normal nutritive solution varied, with one exception, only slightly. Crops receiving raw phosphate and calcium nitrate and for which raw phosphate was unavailable showed very high ratios of calcium oxide to phosphoric acid. Where raw phosphate was added without calcium nitrate all the crops showed about the same ratio. Ratios equal to or less than 1.3, which characterized an entire group of plants, were observed in only two cases.

AGRICULTURAL BOTANY

The biology of flowering plants, M. Skene (*London: Sidgwick & Jackson, 1924, pp. XI+523, pls. 8, figs. 68*).—This book is an attempt to give an account of the way in which the flowering plant lives, especially in relation to its environment, biology, as here used, referring to the plant rather as an individual than as a member of a community. A certain amount of pure physiology is found needful to carry out the present purpose. The several chapters deal with the absorption of water and salts, assimilation and transpiration, special modes of nutrition, mechanical problems, reproduction and dispersal, and development. The bibliography and index of plant names are extensive, and the subject index is analytical.

Botany of plants important to cultural technology and agriculture, L. Wittmack (*Botanik der Kulturtechnisch und Landwirtschaftlich Wichtigen Pflanzen. Berlin: Paul Parey, 1924, 5. ed., rev., pp. VIII+351, figs.* [217]).—The first main division of this book is devoted to lower plants, the second dealing in its ten chapters largely with botanical and practical phases.

Imperial Botanical Conference, London, July 7–16, 1924. Report of Proceedings, edited by F. T. Brooks (*Cambridge: Univ. Press, 1925, pp. XV+390, pls. 3, figs. 10*).—Papers presented at this conference on plant physiology are grouped under the heads physiology of crop yield and biological problems of the cold storage of apples; on genetics under economic possibilities of plant breeding and value of selection work in the improvement of crop plants; on plant pathology and mycology under relation of plant pathology to genetics, obscure plant diseases of widespread occurrence, relation of forest pathology to silviculture, and fungal attacks on timber; on systematic botany and ecology under best means of promoting a complete botanical survey of the different parts of the Empire, correlation of taxonomic work in the dominions and colonies with work at home, and survey and study of vegetation and training in ecological field work; and on education and research under possibility of promoting an interchange of staff and postgraduate students between the overseas and home universities and research institutions, and desirability of providing further facilities for botanical research in the dominions, colonies, and protectorates. Discussion was had on rules of nomenclature, and lectures were delivered on the economic botany of West Africa, the Peradeniya Botanic Garden, and records of ancient plants within the Empire.

Plant physiology [at the Citrus Experiment Station] (*California Sta. Rpt. 1925, pp. 40, 41*).—In a study of factors influencing shoot formation in lemon trees, F. F. Halma found that few, if any, of the plant nutrients were effective in overcoming basipetal development of buds or diminished growth in the subapical portion of the stem. The total amount of shoot growth was found to be proportional to the mass of the parent shoot.

In continuation of work previously reported (E. S. R., 55, p. 23), H. S. Reed and A. R. C. Haas found that calcium carbonate in neutral or alkaline conditions may not furnish enough calcium for the healthy growth of orange trees, and that the continued acquisition of potassium in such cases may lead to unfavorable physiological conditions.

Reed and E. T. Bartholomew, in the study of the effect of hot drying winds on citrus trees in California, found that older citrus leaves lost water more rapidly than younger ones. Spraying with heavy oil is said to have shown some protection against the leaf scorch due to hot, dry winds.

A study of the physiological factors influencing root growth in Citrus is said to have shown that the optimum temperature for the growth of citrus roots and root hairs is about 27° C. The reaction of the solution best suited to the growth of sour orange seedling roots was found to be near pH 7, but no correlation was found between the reaction and the production of root hairs. The growth of sour orange seedlings appeared to be inhibited by a diminished oxygen supply, but the growth of root hairs was not influenced by sending a current of air through the solutions.

Methods of ascertaining germinability without germination tests [trans. title], D. N. Nelíubov (Neljubow) (*Zap. Semenovedeniîa* (*Ann. Essais Semences, Jardin Bot. Leningrad*), *4* (*1925*), *No. 7, pp. 14–35*).—Distinction between viable and dead (or at least nonviable) seeds is said to be readily practicable by observation of the behavior of colorants named in connection

with effects produced on seeds tested. Related literature is cited (26 references).

The nonoccurrence of germination of seeds while in the mother plant [trans. title], H. OPPENHEIMER (*Sitzber. Akad. Wiss. [Wien], Math. Naturw. Kl., 131 (1923), I, No. 9–10, pp. 279–312, pl. 1*).—Investigations here detailed as bearing upon the causes underlying the fact that seeds often germinate much more freely on sand or filter paper than in the plants which produced them, are said to show the causes of low germination rate in such cases to be, usually, the lack of water or of acids, or the presence of inhibitory substances.

Germination-inhibiting substances in fruits of Solanum lycopersicum and other plants [trans. title], H. OPPENHEIMER (*Sitzber. Akad. Wiss. [Wien], Math. Naturw. Kl., 131 (1922), I, No. 1–3, pp. 59–65*).—It appears that the germination-inhibiting substance in *S. lycopersicum* was precipitated by alcohol.

Note on the development of root systems of willow cuttings in nutrient solutions, T. WALLACE and H. P. HUTCHINSON (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt. 1924, pp. 25–29*).—This experimentation is described as undertaken to see whether results could be obtained in a relatively short time on the characters of root systems developed by woody plants in nutrient media lacking in one of the essential elements of plant food. Attention is drawn to the characters of the root systems formed by growing cuttings in nutrient solutions deficient in potassium and calcium, respectively. In both cases, the root systems appeared to be markedly deficient in fiber. Results similar in character from other work are referred to.

Adaptability of the hydroquinone electrode to the determination of pH in expressed plant saps [trans. title], M. DOMONTOVICH (DOMONTOVITSCH) (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 2 (1925), No. 11, pp. 700–712, fig. 1*).—Having carried out determinations of the pH in several plant saps with the hydroquinone and with the hydrogen electrode methods, the author found fair agreement in the results of these two.

Studies on uptake of salts by plants.—I, The antagonistic influences of ions [trans. title], H. LUNDEGÅRDH and V. MORÁVEK (*Biochem. Ztschr., 151 (1924), No. 3–4, pp. 296–309, figs. 3*).—Cations and anions of a number of salts which are the determining factors in plant nutrition, strongly influence, in concentrations of N/400 to N/100, the uptake of K, also of NO_3 and PO_4, from solution of N/50 concentration. Some ions, K, Ca, Mn, Al, and NO_3, H_2PO_4, and PO_4 appear to act as colloidal only. Others behave variously, and it is undetermined as to how they affect protoplasm. The influence of ions depends, usually very markedly, on their concentration.

Growth stimulation of Aspergillus niger by a vitamine B preparation, N. J. SCHELLING (*Bul. Torrey Bot. Club, 52 (1925), No. 6, pp. 291–310, figs. 14*).—Observations are noted on the effects of vitamin B upon wheat seedlings and upon Lemna. The effects upon vegetative growth in *A. niger* appear to be similar to those produced by small doses of toxic substances.

The physiology of the nutrition of fruit trees.—I, Some effects of calcium and potassium starvation, C. E. T. MANN (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt. 1924, pp. 30–45, pls. 2, figs. 2*).—The effects are described of a deficiency of potassium and calcium on the growth and development of young apple trees in sand cultures. With deficient potassium there were small leaves very subject to leaf scorch. Deficient calcium resulted in leaves considerably larger than those borne on trees supplied with a complete culture solution.

In case of gooseberry bushes in similar cultures, a deficiency of potassium resulted in leaves with lowered water content as compared with those grown from

the complete solution. Deficient calcium resulted in leaf water content higher than shown in the series in complete solution. The ability of the leaves to resist evaporation was least in the potassium-starved and greatest in the calcium-starved leaves.

Preliminary experiments on the comparison of the transpiring power of the leaves of apple trees in sand cultures indicated that under dull light the rate of transpiration was lowest in case of the potassium-starved leaves. In bright sunlight the transpiration rate of these leaves rose rapidly and was generally higher than that of the leaves of the other two series.

Reciprocal action between plants and soil in dry portions of southeast Russia [trans. title], N. M. TULAĬKOV (TULAJKOW) (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 2 (1925), No. 9, pp. 502–519*).—The author has concluded that in the dry year 1924 water utilization by plants in growing pots and in fields was much the same, though proof of this agreement is rendered less definite by the difficulty in ascertaining the amount of transpiration in case of field crops. Detailed conclusions are given.

Growth of appressoria in Botrytis cinerea [trans. title], T. PFAFF (*Centbl. Bakt. [etc.], 2. Abt., 63 (1925), No. 9–17, pp. 161–173, figs. 22*).—It is stated that the formation of appressoria by Botrytis is conditioned upon a considerable pressure. Conditions relating to growth and its cessation are outlined.

The effect of wounds upon the rotation of the protoplasm in the internodes of Nitella, S. P. NICHOLS (*Bul. Torrey Bot. Club, 52 (1925), No. 7, pp. 351–363, figs. 4*).—Using Nitella, the internodal cells of which are said to be unusually favorable to studies of the response to traumatism of active cells and the actual nature of the traumatic shock, it is concluded that toxic substance formed by the injured protoplasm and present in the region washed by the cytoplasm might account for certain of the effects noted. The increased immunity to such toxic substance which is apparent after several punctures suggests that an antitoxin or antidote may have developed in the protoplasm, as does also the gradual recovery of the injured region as it is washed by the protoplasm.

Amitosis, fragmentation, and vacuolization of plant cell nuclei [trans. title], J. KISSER (*Sitzber. Akad. Wiss. [Wien], Math. Naturw. Kl., 131 (1922), I, No. 4–5, pp. 105–128, pls. 2*).—Cell changes are noted in connection with a number of genera and species named.

A review of the discovery of photoperiodism: The influence of the length of daily light periods upon the growth of plants, K. F. KELLERMAN (*Quart. Rev. Biol., 1 (1926), No. 1, pp. 87–94, pls. 8*).—This is chiefly a selective review of the work of Garner and his associates (E. S. R., 51, p. 125) on light periods as related to plant growth.

Quantitative oscillations in the foliar structure of herbaceous plants [trans. title], V. G. ALEKSANDROV and O. G. ALEKSANDROVA (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 2 (1925), No. 11, pp. 713–725*).—The authors planted in vessels at intervals *Helianthus annuus*, *Atriplex hortensis*, *Carthamus tinctorius*, and *Datura stramonium*, and they give herein data obtained or calculated from the resulting plants as regards anatomical characters of higher or lower leaves.

Each plant (independently of ecological types) showed, in relation with the time of seeding, variations in the number and size of the stomata and of the cells of the palisade tissue.

Plants having xerophytic structure showed the largest number of stomata during hot, dry weather; those of mesophytic type, near spring and autumn. Plants produced at the beginning of summer (May 15) showed more stomata

on the upper leaf surfaces, whereas the reverse is usually the case. Shade plants produced in autumn often showed more stomata than did those growing in open sunshine.

Pigment studies with special reference to carotinoids in fruits, G. E. Howard (*Ann. Missouri Bot. Gard., 12 (1925), No. 2, pp. 145–212, pls. 9*).—This investigation, concerned primarily with the carotinoids, is reported in sections under plastid studies, the use of the colorimeter in the determinations of relative amounts of fruit pigment, determinations of the presence of certain pigments in various fruits, and ripening experiments.

During the ripening of fruits a change occurred in the shape of the plastids. In some red-ripe fruits the pigment was crystalline. Lycopersicin crystals were present in red-ripe fruits of *Solanum lycopersicum, Cucumis citrullus,* and *Aglaonema treubii.* Dried tomato pulp kept in the dark for five months lost very little color. A characteristic lycopersicin spectrum was obtained with a carbon disulfide extract of pigments from ripe fruits of *A. treubii, S. lycopersicum, Rhus canadensis, S. dulcamara, Arisaema triphyllum,* and *Citrullus vulgaris.* A characteristic carotin spectrum was obtained from *Celastrus scandens, S. pseudo-capsicum, Euonymus americanus, Rosa rugosa, E. europaeus, Asparagus officinalis, Capsicum annuum, Lycium halimifolium, Cucumis melo, Viburnum opulus,* and *Sorbus sitchensis.* Anthocyanin pigments only were found in fruits of *Gaultheria ovatifolia, Symphoricarpos orbiculatus, Fragaria* sp., *Rubus spectabilis, Sambucus callicarpa,* and *Vaccinium parvifolium.* Both anthocyanin and carotinoid pigments were found in fruits of *Crataegus phaenopyrum, R. rugosa, Sorbus sitchensis, Lonicera* sp., and *Viburnum opulus.* Carrot carotin occurred in both crystalline and granular forms, but free in the cytoplasm. It appeared to be stored in the medullary rays. The optimum temperature for the rapid ripening of *Lycium halimifolium* fruits was 26–28° C. (78.8–82.4° F.) and for pepper fruits 22–24°.

Longevity of pollen of some plants [trans. title], A. Manaresi (*Staz. Sper. Agr. Ital., 57 (1924), No. 1–3, pp. 33–55*).—Data are cited regarding pollen cell longevity in a number of plants, including apple, pear, peach, cherry, plum, and grape.

The phytometer method in ecology: The plant and community as instruments, F. E. Clements and G. W. Goldsmith (*Carnegie Inst. Wash. Pub. 356 (1924), pp. VI+106, pls. 11, figs. 45*).—This account deals systematically with the scope and essentials of the phytometer method in ecology; climaxes and climates of the Pike's Peak region; methods and results; seasons (separately) of 1918–1920, and 1923; related applications of the phytometer method; and a résumé setting forth the values and limitations of the phytometer method. This method has during six years of experience shown itself to be indispensable to quantitative studies, its sole limitation being the labor and expense involved in case of growth phytometers carried out on a large scale for the entire season. The plant or community alone can measure the factor-complex, as well as the efficient factors in it and the effect of their fluctuation. They are the only measures of the decisive part played by competition and of the far-reaching effect of animal reactions upon vegetation. It is only by the exact evaluation of the control exerted by factor, competition, and animals that it becomes possible to distinguish present and past effects in vegetation.

Hemizonia congesta: A genetic, ecologic, and taxonomic study of the hay-field tarweeds, E. B. Babcock and H. M. Hall (*Calif. Univ. Pubs., Bot., 13 (1924), No. 2, pp. 15–100, pls. 7, figs. [3]*).—In the present study, preceded by certain observations which have been recorded (E. S. R., 47, p. 629), an attempt has been made to synthesize from widely divergent sources evidence

relating to the evolution of a small but complex group of organisms. This evidence has been derived from studies in genetics, cytology, ecology, comparative morphology, and geographic distribution. The problem has been viewed from the standpoints of the geneticist, the ecologist, and the field taxonomist. A general agreement in the results has been found, though on some points it has been necessary to recognize two hypotheses, neither of which could be definitely proved. The numerous possible character combinations have led to a large number of natural forms, some of which have previously been classed as distinct species. On account of intergradations, hybrids, and genetic behavior, the entire assemblage is treated as one taxonomic species, *H. congesta.*

Studies on the Coccaceae, VI, VII, (*New York State Sta. Tech. Bul. 118 (1926), pp. 3–28*).—In continuation of the studies on the Coccaceae (E. S. R., 52, p. 519) the following are reported.

VI. *The agglutination reaction as a test for differentiating the micrococci,* G. J. Hucker (pp. 3–15).—The author reports that a study of the agglutinating properties of 41 strains of 13 selected species of micrococci indicates that the agglutination or agglutination-absorption tests are not applicable to the differentiation of the various species of micrococci. The wide variation found among individual strains, together with a lack of correlation between the serological and other biological characters, is said to suggest that groups formed on a serological basis alone are not natural species.

VII. *The serological relationships of strains of micrococci isolated from similar habitats,* G. J. Hucker and A. H. Robertson (pp. 16–28).—From a study of 62 strains of 5 species of micrococci freshly isolated from similar sources no relation was found between the habitat of the various organisms and their agglutinating properties. Strains culturally identical and isolated from the same source do not necessarily give similar agglutinating reactions. The authors claim that a study of the agglutination reactions of these freshly isolated strains showed relatively constant results for the same strain but a large amount of variation between different strains. From the irregularity of these differences, however, it is concluded that the formation of serological groups based upon the results of agglutination and agglutination-absorption tests would not be warranted.

***The life-cycle of the nodule organism Bacillus radicicola (Beij.) in* soil and its relation to the infection of the host plant,** H. G. Thornton and N. Gangulee (*Abs. in Nature [London], 117 (1926), No. 2938, p. 289*).—A regular cycle of changes was found, unbanded rods, cocci, and banded rods successively predominating in the soil. Increase in the percentage of cocci was associated with increased bacterial numbers and with the appearance of motile forms. When soil and sand are inoculated with a suspension of the bacteria, the latter after a lag period commence to spread radially at a rate of about 1 in. in 24 hours. The lag seems to be related to the time taken for cocci to predominate in the soil, and is decreased by using milk and 0.1 per cent of calcium phosphate as the inoculating fluid. The bacteria multiply rapidly in the soil into which they have recently spread.

Alfalfa plants (E. S. R., 53, p. 232) grown from seed inoculated with a suspension of bacteria in milk to which 0.1 per cent calcium phosphate had been added showed a considerable increase in nodule numbers, and in yield compared with plants from seed inoculated with a suspension in milk alone.

A nitrogen-fixing Spirillum [trans. title], M. W. Beijerinck (*Centbl. Bakt. [etc.], 2. Abt., 63 (1925), No. 18–22, pp. 353–359, fig. 1*).—A nitrogen-fixing Spirillum, here discussed as to certain of its characters, is named *S. lipoferum.*

GENETICS

Genetics (*California Sta. Rpt. 1925, p. 55*).—By crossing species of Crepis (E. S. R., 53, p. 425) differing in chromosome number, new forms are produced in subsequent generations having chromosomes and characters from each parent. Cytological examination of the chromosomes in a number of species indicated that a knowledge of chromosome number, size, and shape may assist in systematic classification of species within a genus.

Variations in the chromosome number in Nicotiana were discovered. Haploids were found in two species, while in one species there were two cases of an extra chromosome, these irregularities being correlated with genetic behavior. In one case a species hybrid has double the expected number of chromosomes and is fertile, while the hybrid with the normal number of chromosomes is very nearly sterile.

Cytological studies (E. S. R., 52, p. 628) on varieties of tomatoes revealed chromosome irregularities giving rise to triploids and trisomics.

Fifth Annual Report [of the Animal Breeding Research Department, Edinburgh University, 1924–25], F. A. E. Crew (*Edinb. Univ., Anim. Breeding Research Dept. Rpt. Dir. 1924–25, pp. 21*).—This is a mimeographed report of the investigations completed and those which were in progress during the year ended March 31, 1925, including a list of the papers published by the investigators in the animal breeding research department of Edinburgh University.

Chromosome breakage by X-rays and the production of eggs from genetically male tissue in Drosophila, H. J. Muller and A. L. Dippel (*Brit. Jour. Expt. Biol., 3 (1926), No. 2, pp. 85–122, fig. 1*).—A more complete account of the investigation previously noted by the senior author (E. S. R., 54, p. 432).

Unusual coat colors in swine, H. C. McPhee and J. H. Zeller (*Jour. Heredity, 16 (1925), No. 9, pp. 347–350, figs. 2*).—Four purebred Poland China pigs of a dilute black color similar to sepia in guinea pigs were produced in brother and sister matings by 2 sows (sisters) in inbreeding experiments conducted by the Bureau of Animal Industry, U. S. D. A. The sepia pigs also had numerous white spots on the shoulders, back, rump, and sides. Each sow produced 2 pigs of this type in litters born in the spring of 1925, but none occurred in the litters produced in 1924 or in the fall of 1925. The total pigs which these sows have produced were 31 black and 4 sepia.

Two Chester Whites (sisters) when bred to their brothers produced 6 white pigs and 3 tricolored (black, red, and white pigs). The markings of these 3 individuals were variable. A sister of the sows producing the tricolored pigs when mated to the same boar produced 7 white pigs. The part played by inbreeding to bring out hidden characters is pointed out.

Studies of inheritance in pigeons.—V, Lace or silky, a sex-linked character, D. G. Steele (*Jour. Heredity, 16 (1925), No. 9, pp. 321–327, figs. 3*).—The author presents data collected by F. E. Pollex[1] in breeding experiments, which showed that the silky or lace character of the feathers in pigeons is inherited as a sex-linked recessive. The matings used in these experiments included homozygous normal males with silky females, recessive (silky) males with normal females, and heterozygous normal males with normal and silky females. The previous paper in this series has been noted (E. S. R., 48, p. 565).

Reptilian fowls, I. E. Cutler (*Jour. Heredity, 16 (1925), No. 10, pp. 353–356, pl. 1, figs. 3*).—Fowls having shortened leg and wing bones and known as Dumpfries, Creepers, and Brevicrews are described. The wings show no other

[1] Amer. Pigeon Keeper, 26 (1924), No. 3, pp. 19–21.

change than the shortening, but in the legs the fibula is developed as a complete bone extending the full length of the tibia. There is a distinct thickening and bending forward of the tibia, which appears to be caused by an unequal rate of growth of the two bones. In some chicks the legs bend out, and a few are unable to walk but move on the ground somewhat like a lizard, using both legs and wings for propulsion. Crosses of these birds with normal fowls give approximately half creepers. Matings of the creepers inter se increase the proportion of creepers. It is suggested that the creepers are heterozygous, and that the birds unable to walk, none of which are raised, are homozygous.

Inheritance in Nicotiana tabacum.—VI, A Mendelian analysis of certain flower form, flower and filament color, and leaf-base characters, M. A. Kelaney (*Calif. Univ. Pubs., Bot., 11 (1925), No. 2, pp. 31–59, figs. 6*).—This article continues the series already noted (E. S. R., 51, pp. 826, 827).

The several flower forms studied exhibited the following Mendelian differences: *C C Ap Ap* = normal, *c c Ap Ap* = calycine, c^a c^a *Ap Ap* = Klebs-normal, c^a c^a *Ap ap* = lacerate, and c^a c^a *ap ap* = apetalous. (*C* = normal, *c* = calycine, and c^a in conjunction with *Ap* and *ap* = Klebs type (E. S. R., 41, p. 736). *Ap ap* = normal v. apetalous flower form.

Results from this study on flower color agree with those reported previously. Two pairs of factors account for the relation existing between red, light pink, and white flower colors, and a third pair is necessary to account for carmine. The epistatic complementary factor *G* with the flower color factor *P* produces pink filament color. If one or both are represented by the recessive allelomorph a light green filament is produced.

Mendelian differences presented by five main leaf-base types were as follows: *SSAA*=lanceolate, *SSaa*=petioled, *ssAA*=broad, *SsAa*=short-petioled F_1, and *ssaa*=constricted. The factor pair *Ap ap* showed trisomic inheritance ratios in association with the trisomic character, "enlarged." Linkage with 7.5 per cent of crossing-over was found between the factors *A a* for leaf-base type and *P p* for flower color.

The occurrence of starch and erythrodextrin in maize and their segregation in the pollen of hybrids, T. A. Kiesselbach and N. F. Petersen (*Genetics, 10 (1925), No. 1, pp. 86–89, pl. 1*).—Experiments at the Nebraska Experiment Station indicated that differences in staining of corn pollen with iodine should not be interpreted as segregation. In the corn varieties and hybrids tested, all normally developed mature pollen gave the starch reaction with iodine, and differences were not seen in the color reaction of the contents of crushed mature pollen grains. In all varieties immature pollen which had not yet developed starch stained reddish with iodine solution. Apparently the interpretation of variation in the color reaction of pollen to iodine, by investigators cited, may be accounted for by the lack of a comparative study of pollen at different stages of maturity. Except in the endosperm, starch had the same distribution in Chinese maize as in starchy and sweet varieties compared therewith.

Dry matter of swedes, I, F. W. Sansome (*Jour. Agr. Sci. [England], 16 (1926), No. 1, pp. 51–58, fig. 1*).—Several experiments were made at the Scottish Plant Breeding Station, Corstorphine, to find a suitable method of sampling single roots of swedes and turnips, a prerequisite to investigating the inheritance of dry matter content, and thus to selection on that basis.

Sampling of single roots of swedes by means of cores seems subject to errors, one of which, due to asymmetrical growth of the root in a north-south direction, has evidently been overlooked previously. Cores should be taken horizontally in a north-south direction. Marked decrease in dry matter content during winter and spring, noted in plants remaining in the field, is presumably

due to movement of food material from the root into the developing flowering stem. The fresh weight of a core was found to be a function of the weight of the whole root, except in Tankard swedes. A significant negative correlation (autumn −0.66, spring −0.51) existed between dry matter content and fresh weight of core, and hence between dry matter content and size of root. Evidence of the inheritance of dry matter content was obtained for one pair of strains of common parentage.

Polyembryony, heterozygosis, and chimeras in citrus, H. B. Frost (*Hilgardia* [*California Sta.*], *1* (*1926*), *No. 16*, *pp. 365–402*, *figs. 7*).—Based on studies of pedigree citrus stocks at the Citrus Experiment Station, the author reports that polyembryony occurs generally in citrus from adventitious embryos developing from proliferation of cells surrounding the embryo sac. Embryos were often much more numerous than the resulting seedlings, and horticultural varieties differed greatly in the amount of apogamy. That citrus species are extremely heterozygous was indicated in the great variability occurring in the F_1 generations of interspecific and intergeneric crosses. Selfed seedlings, on the other hand, quite closely resembled the parent. Fertilization is deemed to be generally necessary for the initiation of apogamic development. Sexual embryos are often eliminated in competition with apogamic embryos, particularly in clones in which apogamic embryos are especially abundant. Because of the frequent development of homozygosis of unfavorable genes, it is believed that the elimination of sexual embryos will be greatest in selfed and least in relatively wide crosses. Some evidence was obtained to show that sexual progeny from selfing were fewer and weaker than those from crossing. Marked heterosis was noted in certain wide crosses, indicating the beneficial effect of crossing. It is believed that apogamy has been a potent factor in the development of the very complex condition of heterozygosis. Records show that a certain thick-leaved apogamic form, presumably always tetraploid in nature, has been produced by 4 different species and 12 horticultural varieties.

Bud variations and sectorial, periclinal, and mixed chimeras are common in citrus. Bud variations are believed to arise by gene mutation or differential mitosis in single cells. So frequent are bud variations in certain forms of citrus that the author suspects the presence of a special genic instability. Synthetic chimeras result from graftage. Such remarkable phenomena as the apogamic production of fertile, nonnavel oranges from pollen-sterile navel orange forms is thought due in part to the chimeral conditions of the parent tree. The frequent occurrence of albino seedlings in the offspring of certain parents is believed due to heterozygosis for various genes for albinism, or to the presence of unstable genes.

Heterosis in pigs, E. Roberts and R. J. Laible (*Jour. Heredity*, *16* (*1925*), *No. 10*, *pp. 383–385*, *figs. 4*).—A litter of 10 pigs produced by a Duroc-Jersey sow mated to a Poland-China boar and 12 hours later to a Duroc-Jersey boar at the Illinois Experiment Station is described. Six of the pigs were purebred Duroc-Jerseys and averaged 3.23 lbs. in weight at birth, and 4 were Poland China-Duroc-Jersey crossbreds, as determined by their spotting, and averaged 3.75 lbs. at birth. The 2 purebreds raised to 6 months of age averaged 185.5 lbs., and the 4 crossbreds 235.2 lbs. The differences are attributed to heterosis.

Genetic factors for yellow pigment in maize and their linkage relations, E. W. Lindstrom (*Genetics*, *10* (*1925*), *No. 5*, *pp. 442–455*).—Two genes responsible for the formation of yellow pigments in corn studied at the Iowa State College have proved to be Mendelian recessives in inheritance.

The fact that the gene l_1 interacts with each of the albino genes w_1, w_2, and w_3 so as to give a 12:3:1 ratio, whereas l_2, the new yellow gene, reacts with

these albino genes to produce a 9:3:4 ratio, is thought to indicate a fundamental physiological (or chemical) difference in the yellow pigments of corn, so that one yellow pigment is considered as being independent of the green components of chlorophyll in development and the other not. Linkage tests indicated that both genes are borne on the same chromosome, L_1 and W_3 being about 22 units apart, and L_2 and R approximately 35 units apart, which provides for an arrangement of these factors in this second linkage group in corn as follows: L_1–R–W_3–L_2.

Segregation in halfbred sheep, J. E. NICHOLS (*Jour. Heredity, 16 (1925), No. 11, pp. 401–408, figs. 5*).—This reports the results of a study of the characteristics of the lambs born from matings of F_1 Border Leicester×Cheviot rams and ewes. The conformation, wool, and other characteristics of the two parent breeds and the F_1 crossbreds, populary known as "halfbred," are compared.

It is commonly believed that the halfbreds are an instance of truly blending inheritance and that they breed true. The study, however, showed that the expected segregation occurred in the F_2 generation produced by matings of 114 F_1 ewes with 2 F_1 rams. Evidence of segregation was apparent in the newborn lambs but more so as the individuals became older. Of 103 wethers ready for sale as feeders, 18 were typically Border Leicester in head form, conformation, and fleece characters. One was typically Cheviot, 64 were typically halfbreds, and 20 were intermediate, having characters of both parents. Eighty-three F_2 ewe lambs kept over the winter were classified at approximately 1 year of age as 16 typically Border Leicester, 51 halfbreds, and 16 intermediate. The inheritance of the general characteristics is discussed, and it is pointed out that multiple factors are probably responsible for the more evident characters of the breeds, but no effort was made to determine the number or specificity of the factors.

An albino coyote, G. N. STROMAN (*Jour. Heredity, 16 (1925), No. 9, pp. 342, 343, fig. 1*).—An albino coyote killed in Texas is described.

The development of grafted embryonic fragments of the chick, P. D. F. MURRAY and J. S. HUXLEY (*Brit. Jour. Expt. Biol., 3 (1925), No. 1, pp. 9–34, pl. 1, figs. 17*).—The authors have described the development on the chorio-allantois of 7- to 9- day embryos of the following embryonic fragments: Anterior third of a 24-hour embryo, approximately 4 somites from the middle of a 2-day embryo, and a piece from the middle of a 24-hour embryo. After from 2 to 4 days' differentiation the grafts were removed and studied histologically. This study demonstrated the ability of the various regions of the body to differentiate normally when supplied with food, but there did not appear to be any evidence of regeneration. Mechanical influences markedly modified the asymmetry of development.

The behavior of embryonic chick gonads when transplanted to embryonic chick hosts, B. H. WILLIER (*Soc. Expt. Biol. and Med. Proc., 23 (1925), No. 1, pp. 26–30*).—In conducting this study at the University of Chicago, the Wolffian body with its associated sex gland was removed from chick embryos before and after sexual differentiation and transplanted to the chorio-allantoic membrane of 9-day chick embryos, using technique similar to that employed in the transplants of the thyroids (E. S. R., 52, p. 368). The transplants were allowed to grow for an average period of 9 days, after which they were removed and studied histologically.

The transplantation of the gonads before sexual differentiation (4 to 6.75 days) indicated that they have specific organizations for sex and laterality at this stage, as gonads typical of both sexes and laterality of the ovaries developed on hosts of both sexes. The gonads transplanted after sex differentiation (7 to 13 days) developed normally as far as could be determined

on each sex. Variations in the histological factor were observed which were attributed to the technique employed. Variations in the development of the sex organs and ducts of the hosts were found, but such conditions were also observed in control embryos.

Histological studies on the gonads of the fowl.—III, The relationship of the " luteal " cells of the ovary of the fowl to the tissue occupying the atretic and discharged follicles, and the question of the homology of the latter tissue and the mammalian corpus luteum, H. B. FELL (*Quart. Jour. Micros. Sci. [London], n. ser., 69 (1925), No. 276, pp. 591–609, pl. 1, figs. 4*).—In continuing this series of studies (E. S. R., 53, p. 329), the ovaries of 11 adult hens, 4 of which were laying and 3 of which had ovaries in an early stage of atrophy, were used for a study of the tissue of atretic and discharged follicles. It was found that such tissue was derived almost entirely from the membrana granulosa and the connective tissue cells of the theca interna by fatty infiltration and follicular contraction, and was markedly different from luteal cells and appeared like fatty degeneration. There was no significant resemblance between this tissue and the mammalian corpus luteum. The yellow pigment in the former was due to haemosiderin, a blood pigment derived from the erythrocytes of aborting blood vessels. It is concluded that a true corpus luteum does not occur in fowls.

On the descended testes of sex-intergrade pigs, J. R. BAKER (*Quart. Jour. Micros. Sci. [London], n. ser., 69 (1925), No. 276, pp. 689–701, figs. 8*).—The results are given of histological studies of the testicles of 4 sex-intergrade pigs in which the testicles had descended. Three of the pigs were described in a previous paper (E. S. R., 53, p. 631).

The results showed that in the seminiferous tubules of one of the testicles of 1 pig estimated at 8 months of age spermatogenesis was in progress. The seminiferous tubules were largely degenerated in all the other testicles. It is suggested that a similar type of metabolism may hinder normal spermatogenesis. Interstitial cells were present in normal or more than normal amounts, and they were probably active. The possibility of the sex chromosome equipment of sex-intergrade animals being abnormal is mentioned.

Studies on the oestrous cycle in the rat.—I, The effect of thyroidectomy, M. O. LEE (*Endocrinology, 9 (1925), No. 5, pp. 410–420*).—The length of the oestrous cycle was found to average 4.8 days in 15 female rats used as controls for this experiment, as compared with 5.9 days for 29 females from which the thyroids were removed. The cycles of 11 females in which the thyroids were partially regenerated after removal averaged 5.4 days, with a gradual decrease in the length of the period as the regenerated tissue became more abundant, so that they averaged 4.8 days for the last 10 cycles. The 7 animals thyroidectomized before puberty showed no postponement in attaining puberty. It is suggested that the thyroid exerted a stimulating effect on the development of the ovarian follicles, or that the ovarian activity may depend on general body vigor which is lowered by thyroidectomy.

FIELD CROPS

[Field crops work in California] (*California Sta. Rpt. 1925, pp. 34–36, 56, 57, 69, 70*).—In continuation of previous work (E. S. R., 53, p. 430) are set forth the merits of Harding grass, Heileman dwarf milo, sesame, Kanota oats, and Hopi Lima beans and significant results in crop sequences at Davis (E. S. R., 54, p. 230). The yields of leading wheat varieties are listed.

Fallowing, growing summer cultivated crops, or growing winter cover crops to be plowed under in April and the land fallowed for the remainder of the

summer were found by J. W. Gilmore to materially reduce the amount of wild oats in the succeeding wheat crop, as compared with continuous wheat. This control of wild oats is soon lost by growing crops of wheat continuously again. Continuous applications of barnyard manure in a rotation of wheat, cowpeas, and corn at Kearney Park resulted in decreasing yields year after year until practically no crop is produced.

In the San Joaquin Valley, sandy soils growing alfalfa seemed to require for most economical production from 36 to 42 acre in. of water per acre per year where irrigation water costs about $1.50 per acre foot, about 6 acre in. more than established requirements at Davis.

Rice investigations at Cortena further indicated the effectiveness of water grass control on old fields through all-season submergence to depths of 6 to 8 in. and suggested that rice can be profitably grown continuously on California rice soils.

Exposure of potato tubers to certain gaseous hydrocarbons and esters were found very effective in terminating the dormant period (E. S. R., 53, p. 636). This general method seemed free of many of the practical objections to that of treatments with oxidizing agents. Study of tuberization (E. S. R., 53, p. 635) in the potato showed a great accumulation of polysaccharides in the leaves and in the underground stems incidental to tuberization. While no starch was found in the leaves and above ground stems and little in the main underground stem or in the roots, the stolons are liberally supplied with starch, deposited both in the parenchyma cells of the pith and in the cortex, in increasing amounts toward the tip, where the tuber arises. Potato plants brought to the tuberization stage in the warmer part of the summer formed no tubers, and the accumulation of carbohydrates was slight.

[Field crops experiments at the Crookston, Minn., Substation, 1924], C. G. Selvig (*Minnesota Sta., Crookston Substa. Rpt. 1924, pp. 6–8, 9, 10, 15–32, 32–34, 45–48, 51–58, figs. 9*).—Investigations with field crops reported on in continuation of previous work (E. S. R., 53, p. 130) included variety tests with spring wheat, oats, barley, rye, corn, flax, alfalfa, sweet clover, soy beans, potatoes, sugar beets, and mangels; seeding tests with wheat, barley, rye, corn, flax, alfalfa, and soy beans; trials of wheat-flax and oats-flax mixtures; soil preparation, seed selection, spraying, and fertilizer trials with potatoes; fertilizer tests with sugar beets and mangels; scarification tests with sweet clover and alfalfa seed; comparison of control methods for sow thistle; and crop rotations.

[Field crops investigations in Texas] (*Texas Sta. Rpt. 1925, pp. 25, 26–28, 29–31*).—Among the experiments reported on from the station and substations were variety tests with wheat, corn, oats, cotton, and cowpeas, and breeding work with wheat, oats, cotton, sorghum, and rice. Eight years' experiments with intertillage are said to indicate that weeds are the principal considerations in tillage operations, that just enough cultivation to control weeds effectively is the best kind of tillage, and that the ordinary cultivator is perhaps the best implement for this purpose.

Seed bed preparation studies with cotton at the Lubbock and Chillicothe Substations gave indications that preparation of the seed bed to a medium depth fairly early produces the best results on soils that do not blow, whereas on soils tending to blow later preparation seemed advisable. Cotton has produced maximum yields when thinned to from 9 to 18 in. in rows of ordinary width, except in the sandy soils of east Texas where wider spacing, from 18 to 33 in., has given best results. Deferred thinning decreased the yield as compared with thinning at the usual time.

Present indications in the fertilizer trials with rice at Beaumont are that ammonium sulfate at the acre rate of 100 lbs. is the most profitable treatment. Acid phosphate has not increased yields, but in combination with ammonium sulfate it gave results similar to those with ammonium sulfate alone. Application of fertilizers at a medium late date, i. e., just before the rice reached the boot stage, appeared to give best returns.

Phenotypic classification of F_2 kafir hybrid material indicates possible linkage between number of seed-bearing branches and length of seed-bearing branches and in some other combinations. Further studies on albinism in kafir indicate rather conclusively that albinos and pure green differ by only a single factor. Virescent whites and other classes appear to be somewhat more complex.

[Agronomic investigations in the Virgin Islands, 1925], J. B. Thompson, W. M. Perry, and M. S. Baker (*Virgin Islands Sta. Rpt. 1925, pp. 4–6, 10, 13–16*).—Experiments with field crops (E. S. R., 54, p. 231) reported on included breeding work with corn, comparisons of sweet potato seedlings (E. S. R., 54, p. 333) and varieties and pollination studies, variety tests with yams, variety and cultural tests with cotton and sugar cane, trials with miscellaneous legumes, and determination of the sucrose content of sweet potatoes before and after storage.

The effect of the date of " putting up " to hay on the several species contributing to the sward of a temporary ley, R. G. Stapledon and W. Davies (*Welsh Jour. Agr., 2 (1926), pp. 116–133*).—These studies supplement those carried on previously (E. S. R., 52, p. 133) at Aberystwyth, Wales.

Under a carefully executed scheme of spring grazing the amount of Italian rye grass in the hay can be restricted, minimizing its competitive effect on slower growing elements in the herbage. Heavy April grazing depressed the yield of species or strains making early growth more than those starting active growth later in the spring. When grazing was continued far into May, the effect became more pronounced, even late species and strains suffering considerably. Inclusion of Italian rye grass in the mixtures may protect against the overgrazing of other elements in the herbage. April grazing caused an increased hay yield of the slow growing species. The weed flora as a whole was affected similarly. Indigenous grasses and clovers even in their second year outyielded commercial stocks.

The influence of the date of enclosing fields for hay upon the yield and chemical composition of the crop, T. W. Fagan and R. E. Evans (*Welsh Jour. Agr., 2 (1926), pp. 134–142*).—The time of inclosing fields for hay appears from results at Aberystwyth to have a greater influence on the chemical composition of hay from seed mixtures than of hay from permanent meadows. Seed hay from a plat inclosed later was superior in chemical composition to that obtained from earlier inclosed plats. When yield of grazing and hay is considered, the February inclosed plat gave the best results. Hay and grazing of the best quality were given by grasses with a high percentage of leaf.

Time of mowing experiments at Flahult [trans. title], H. Osvald (*Svenska Mosskulturför. Tidskr., 40 (1926), No. 1, pp. 43–57*).—The effect of early (between June 28 and July 6) and late (between July 7 and 15) mowing of lowland moor and upland moor meadows was studied during three years, 1919–1921. The total yields for the period favored early mowing only when second cuttings were included. The first year the largest yields were secured on late-cut plats. The use of 300 kg. of sodium nitrate per hectare (267 lbs. per acre) after the first cutting gave an average increase in the second cutting of about 80 per cent, which was unprofitable. All the grasses, especially

meadow fescue, were benefited by this treatment. The especially small second growth on the upland moor meadows was attributed to the shallow root system, 8 to 12 in. deep, on such soils in comparison with lowland moor meadows.

Among the grasses timothy predominated, while clover was unimportant and its stand was reduced, especially where sodium nitrate was applied. The time of first cutting affected the second cutting of meadow foxtail slightly, whereas with delay in the first cutting other grasses made a reduced second growth.

Pastures for Indiana, M. L. Fisher (*Indiana Sta. Circ. 132 (1926), pp. 8, figs. 5*).—Methods for establishing and managing permanent pastures and renovating old pastures are outlined, and grass seed mixtures are suggested.

Some studies in the formation of permanent pastures in North Wales, R. A. Roberts (*Welsh Jour. Agr., 2 (1926), pp. 81–102*).—In pasture experiments in several centers in North Wales, differences between localities, viz., soil or management, greatly exceeded those between the mixtures tested. Soil moisture, available phosphate, and regulation of grazing were outstanding factors. The only modification of the seed mixture clearly and permanently affecting the final herbage was caused by the omission or inclusion of wild white clover.

Only wild white clover and rough stalk meadow grass were aggressive and persistent; crested dog's tail was not aggressive, and timothy, orchard grass, and perennial rye grass were disappointing. Simple well chosen mixtures including wild white clover seemed better than complex mixtures. The decline in productivity and increase in weeds suggest the profitable limits of such mixtures to be three or four years.

Winter resistance and regrowth of quick-growing strains of alfalfa [trans. title], N. Sylvén (*Sveriges Utsädesför. Tidskr., 35 (1925), No. 4, pp. 162–176, figs. 11*).—Two strains of Spanish alfalfa in comparative tests ranked high in the production of green material and in the rapidity of regrowth after cutting. Plats of these strains seeded in 1924 and mowed October 3 suffered much greater winter injury than plats cut October 24. A similar tendency was noted on plats of different alfalfa strains. Plats of the Spanish strains not cut in the fall of 1924 survived the winter with slight injury and made practically a full stand in 1925. These plats were protected by a much deeper snow covering than the mowed plats. A comparison of the Spanish strains and a Hungarian strain with a normal rate of regrowth indicated the relationship of the rapidity of regrowth to winter resistance; under similar treatment the Spanish strains proved the hardier in every case.

Hardy alfalfa (*Ontario Dept. Agr. Circ. 48 (1926), pp. 7, fig. 1*).—The characteristics of Ontario Variegated, Grimm, and common alfalfa are indicated, and based on extended experiments at Ontario Agricultural College and cooperative tests, production and harvesting practices are outlined and ways of utilizing the crop are described.

Note on banana fibre, R. O. Bishop (*Malayan Agr. Jour., 13 (1925), No. 12, pp. 376–381*).—Fiber from cultivated banana varieties seemed superior to that from native wild sorts (*Musa malaccensis* and *M. violascens*) of the Malay Peninsula. While the fiber yield of the cultivated plant is small, it closely resembles the medium grades of "partially cleaned" manila hemp and would be detected with difficulty if used as an adulterant.

The Egyptian clover (Bersim) [trans. title], S. Zemach (*Zionist Organ. Inst. Agr.* [etc.] *Agr. Expt. Sta. Ext. Circ. 8 (1925), pp. 30*).—Practical cultural directions, with rotations suggested for irrigated fields.

Cotton fertilizer experiments 1921–25, Delta Branch Station, W. E. [illegible]es (*Mississippi Sta. Bul. 234 (1926), pp. 16, figs. 4*).—Fertilizer experiments

with cotton included trials of the form, rate, and time of application of nitrogenous fertilizers, tests of complete fertilizer, and cooperative tests.

Ammonium sulfate and sodium nitrate with cottonseed meal led in average increases, but the ammonium sulfate was the cheapest nitrogen source at current prices. The safest and most economical rate for sodium nitrate appears to be from 150 to 200 lbs. per acre. Application of 150 to 200 lbs. of sodium nitrate has paid better on buckshot soil than on loam. Applying half the sodium nitrate at planting and the rest at the second cultivation has been best. Considering experimental results and experience, nitrogenous fertilizers used alone seem most economical for the Delta except along the foothills and on soils in which cotton either rusts or wilts badly. On such soils potash usually pays, and both potash and phosphorus are needed on some of the eastern border of the Delta. Decided increases were made by cotton following soy beans.

Comparative trials with ratoon and annual upland cotton carried out by the Queensland Department of Agriculture in 1924–25, G. Evans (*Queensland Agr. Jour., 24 (1925), No. 6, pp. 523–532*).—Ratoon cotton was an early breeding ground for insects, and compared with annual cotton was harder to cultivate, cost more to pick, and yielded much less per acre. The lint seemed inferior in drag and luster and was shorter in staple, and the fibers were more irregular in length. The grades were definitely inferior. See also a previous note by Summers (E. S. R., 53, p. 137).

The cotton problem and French West Africa, H. Bloud (*Le Problème Cotonnier et l'Afrique Occidentale Française. Paris: Emile Larose, 1925, pp. 390, pl. 1*).—This treatise deals with the cotton question in the French Colonies in Africa, discussing the problem from political, economic, geographical, and agricultural viewpoints. Summaries of the results of different experiments with the crop in the several colonies are included.

The quantitative and qualitative response of cocksfoot (Dactylis glomerata Lin.) to sodium nitrate and to superphosphate, R. G. Stapledon and A. R. Beddows (*Welsh Jour. Agr., 2 (1926), pp. 103–113*).—Trials were made at Aberystwyth to ascertain the reaction of different pedigree strains of orchard grass to certain fertilizers.

These tests confirmed earlier work (E. S. R., 52, p. 133), showing that repeated cutting during a current season makes a total produce much less than that developed by a hay and aftermath crop. Repeated cutting also reduced the number of panicle-bearing shoots and the root systems of plants so cut and retarded early spring growth. Different strains of orchard grass have, however, reacted very differently to cutting and to treatment with sodium nitrate. While the hay yields and the yield and quality of the seed were benefited by sodium nitrate application, neither the percentage dry matter in green hay nor the stem to leaf ratio were materially influenced thereby. Superphosphate had no significant effect on quality or quantity. Neither sodium nitrate alone nor superphosphates alone materially counteracted the depressing influence of repeated pasture cuttings.

The influence of the application of superphosphate and nitrate of soda on the chemical composition of the stem and leaf of pasture cuts of cocksfoot, T. W. Fagan and R. E. Evans (*Welsh Jour. Agr., 2 (1926), pp. 113–116*).—Analysis of produce from the above trials showed superphosphate to result in an appreciable increase in the fiber content of the stem and in an increase in the percentage of crude protein, silica, and lime, with a considerable reduction of chlorine. The effect on the leaf was very similar except that the crude protein percentage was altered little. Application of sodium nitrate influenced both stem and leaf similarly, the crude and true protein as

well as the fiber being considerably increased, while the percentage of phosphoric acid and lime appear to be adversely affected.

Potatoes [trans. title], S. BUKASOV (*Trudy Prikl. Bot. i Selek.* (*Bul. Appl. Bot. and Plant-Breeding*), *15* (*1925*), *No. 2*, *pp. 176*, *pls. 4*, *figs. 2*).—This treatise describes the organs of the potato plant and variations useful in classification, offers a proposed scheme of classification of potato varieties, and gives a critical survey of literature on the genetics of the potato, the technique of potato breeding, the significance of degenerative diseases, and methods of testing varieties and estimating their economic value. The status of the crop and its varieties in the Union of Socialistic Soviet Republics is reviewed, and an English summary is appended.

A further note on competition in potatoes, G. W. MUSGRAVE (*Jour. Amer. Soc. Agron.*, *18* (*1926*), *No. 2*, *pp. 166–171*).—Further data from experiments at the New Jersey Experiment Stations (E. S. R., 52, p. 635) indicated that in 1923 and 1924 the yields of potato rows adjacent to rows of high-yielding plats were depressed. No evidence of competition appeared in 1925, when yields were much below normal. Comparisons for 1924 showed that where border rows were influenced in yield according to whether the adjacent plat rows were high or low yielders, middle rows were not appreciably affected by the same conditions. Single row plats are probably inadvisable in experimental work under the usual conditions in the central New Jersey potato region, and at least one border or buffer row should be used on the margins of such plats.

The utilization of different quantities of water by potato varieties [trans. title], FRECKMANN and SIEGERT (*Mitt. Deut. Landw. Gesell.*, *40* (*1925*), *No. 52*, *pp. 997–1003*).—Supplementing the rainfall during the growing seasons of 3 years by overhead irrigation resulted in average yield increases from eight potato varieties over the control yield, according to the amount of water applied. Varietal differences in response to the irrigation and variation in the starch contents were observed. Seed from the irrigated lots lacked disease resistance and yielded somewhat lower than seed from the controls.

A study of respiration in potatoes, with special reference to storage and transportation, W. D. KIMBROUGH (*Maryland Sta. Bul. 276* (*1925*), *pp. 51–72*, *figs. 6*).—Significant findings in experiments with potatoes have been recorded from another source (E. S. R. 53, p. 636).

Soybeans: Production, composition, and feeding value, J. E. METZGER, M. G. HOLMES, and H. BIERMAN (*Maryland Sta. Bul. 277* (*1925*), *pp. 74–101*, *figs. 7*).—Methods are outlined for the growing of soy beans for hay and seed, and information is presented on soils, rotations, and varieties. Appended tables show the composition of soy bean plants, yields, and agronomic characters at different stages of maturity, and also the seed: straw ratio. A comparison of soy bean hay with wheat bran and mixed hay for dairy cows is noted on p. 367.

Experimental results indicated that soy beans should follow corn in a rotation including corn, wheat, and hay. On several test fields yields of wheat increased when following soy beans as compared with corn. Varietal studies indicate Virginia, Wilson, Ebony, and Haberlandt to be best for Maryland soil and climate. Observations suggest that such varieties as Virginia and Wilson, planted between May 10 and June 1, should be harvested for hay from 90 to 105 days after the plants emerge. On clear days the moisture content of soy bean plants varied from 81.88 per cent at 7 a. m. to 69.95 per cent at 11 a. m., or, based on the average yield of Virginia soy beans, to more than 2 tons of water per acre. Cutting should probably not begin before 10.30 or 11 a. m. and should stop about 3.30 or 4 p. m.

Sugar cane, H. C. Prinsen-Geerligs (*Zuckerrohr. Hamburg: Walter Bangert, 1925, pp.* [4]+*121*).—This book describes the botanical and chemical characteristics of sugar cane, its environmental and cultural needs, important diseases, insect pests, harvest conditions, and sugar manufacture, and the several products of the sugar cane, and gives information on the history, extent, and statistics of sugar cane culture.

Productiveness of varieties of winter wheat in Illinois, R. W. Stark (*Illinois Sta. Bul. 276 (1926), pp. 35, fig. 1*).—Detailed report is made of varietal trials with winter wheat, supplementing earlier investigations (E. S. R., 37, p. 641). The characteristics and behavior of the varieties tested are set forth briefly.

Hard wheats outstanding in winter resistance and yielding capacity at De Kalb included Ilred, Minnesota Reliable, Kanred, Red Russian, and Turkey (station strain). Hardy Northern and Red Cross are soft varieties with satisfactory records. Minnesota Reliable, Worlds Champion, Ilred, Kanred, Malakof (5-460), and Turkey (station strain) comprised the hard wheats with the best records for 8 years or more at the station. Red Russian, Malakof (C. I. 4898), Minturki, Kanred (2401), Michikoff, and Blackhull gave good results during shorter periods. Indiana Swamp, Dawson Golden Chaff (9-225), Red Rock, Red Cross, Michigan Amber, and Gladden were notable among the soft varieties.

Soft varieties seemed best adapted to southern Illinois. Varieties grown for 6 years or more at Fairfield and which made favorable records included Illini Chief, Fulcaster, Red Cross (Harvest Queen), Economy, Marvelous (Fulcaster), and Jersey Fultz. On the Alhambra (Madison Co.) field, Mediterranean, Fulcaster, Rudy, Gipsy, Illini Chief, Red Wave, Marvelous, and Jersey Fultz ranked high in 5 and 6 years' average rating.

The seasonal water requirements of Marquis wheat, W. H. Snelson (*Sci. Agr., 6 (1926), No. 7, pp. 243-249, fig. 1*).—Data from irrigation experiments made with wheat on different soil types at the Brooks, Alta., Experiment Station (E. S. R., 50, p. 828) showed that the water requirements of a wheat crop are almost uniform throughout the season after tillering, averaging between 0.25 and 0.33 in. per day.

In the method found to give the most reliable and consistent results in determining the seasonal water requirements of crops, the water content per foot in depth of soil most favorable to the development of the plant is ascertained by maintaining several plats at different moisture contents. The amount of water used from day to day by the plants growing in soil maintained at optimum moisture content is determined by frequent soil moisture tests.

The variations in the nitrogen and gluten content of wheat [trans. title], A. Dupont (*Ann. Sci. Agron. Franç. et Étrang., 42 (1925), No. 4, pp. 256-275, figs. 6*).—Investigations at the agronomic station at Nancy showed correlation to exist between the nitrogen content of flour and its gluten content. The gluten content fluctuates widely, differences of 50 per cent being noted between localities and even in the same field. The variations of the gluten content and yield of grain are independent, and increase of one is compatible with increase of the other. At the same place and within the same strain, differences in gluten content could be noted in neighboring spikes, if the average weight of the kernels of the spikes differed, and the largest kernels were the richest in gluten.

Within a strain no correlation was found between the gluten content and weight of grain per hectoliter. Rains after harvest, if not so prolonged as to produce germination or mold in the shock, do not modify the quantity or quality of gluten, whereas the weight per hectoliter is reduced considerably.

Although extensive fluctuations render selection for rich wheats difficult, they do not make it useless or impossible.

Wheat production, L. Brétignière (*La Production du Blé. Paris: Libr. Delagrave, 1925, pp. 30, figs. 29*).—Indicating that France can produce all the wheat required therein, the author shows how yields may be increased by proper varieties, varietal improvement, good rotations, soil preparation, fertilizers, good seed, proper cultural methods, rapid harvest, careful threshing, and control of pests.

Report of the [Danish] State seed control for the fifty-fourth year, 1924–25 [trans. title], K. Dorph-Petersen (*Tidsskr. Planteavl, 32 (1926), No. 1, pp. 1–68, fig. 1*).—The activities of the seed control service are reported in detail, and the average results of purity and germination tests of different kinds of seeds for the year are compared with those for the years 1915 to 1925, inclusive.

HORTICULTURE

[Horticultural investigations at the California Station] (*California Sta. Rpt. 1925, pp. 39–41, 46–49, 59, 60, 61, 66–69*).—In this report (E. S. R., 53, p. 436), studies upon the secondary sex characters in asparagus are again discussed (E. S. R., 54, p. 241). Data accumulated by H. S. Reed show that sap concentration in citrus trees is temporarily lowered, but not seriously affected, by pruning. Severe pruning at a critical time in the process of flower or fruit-bud formation may decrease yields. Studies by F. F. Halma upon shoot formation in the lemon showed that few, if any, plant nutrients are capable of overcoming the basipetal development of buds or in preventing reduction of growth in the subapical portion of the stem. The total amount of shoot growth was proportional to the mass of the parent shoot.

Citrus breeding studies conducted by H. B. Frost revealed one thick-leafed orange seedling with tetraploid chromosomes, the haploid number being 18 instead of the normal 9. An unnamed navel orange yielded among apogamic progeny from an interspecific cross several trees which bore flowers with pollen and nonnavel fruits with seeds. Chromosome aberration was noted in certain Matthiola stocks.

Attempts by J. W. Lesley to isolate tomato strains resistant to western blight were partially successful. The Santa Clara Canner tomato was found by Lesley and M. Shapovalov to possess a considerable degree of resistance to Fusarium wilt. A sparsely hairy, unfruitful bud variation was discovered on a plant of the Globe tomato. Two triploid dwarf tomato plants were found.

Soil studies in commercial citrus orchards, completed by L. D. Batchelor and G. Surr, showed that the annual growing of a winter legume cover crop in addition to fertilization is a very satisfactory treatment for mature orchards. Adobe soil worked almost entirely with a plow had better soil texture and a higher content of nitrate nitrogen than plats receiving ordinary tillage. Water penetration of heavy adobe soil was favored by allowing the soil to crack between irrigations. Grain straw or gypsum had little effect on the physical condition of adobe soil. Studies in walnut groves showed that nitrogen is the only nutrient to return a profit, and this was so small that a general investment in fertilizers is not recommended. The supplementing of nitrogen with phosphorus and potash gave no measurable increase in yield.

Almond breeding studies have resulted in several thousand seedlings of known parentage. A few trees showed marked resistance to red spider, coupled with high yielding capacity. Thinning studies with deciduous fruits

conducted by W. P. Tufts and O. Lilleland, showed that other factors besides the number and distribution of the fruit are concerned in determining the size of fruits on a tree. A. H. Hendrickson, in working with peaches at Delhi, found that trees receiving an adequate supply of irrigation water at all times not only made a greater diameter growth but also yielded better than those with insufficient water. Next to sunlight, soil water was the most potent factor in affecting stomatal movement.

Observations upon sour orange and pomelo seedlings growing in Hoagland's nutrient solution showed that aeration of the cultural media had no material effect on top or root growth. Under continued illumination, 26° C. was found to be the optimum temperature for increasing the growth rate of pomelo roots in Hoagland's solution. Sour orange seedlings grew best at pH 7. Carbon dioxide in the soil atmosphere in amounts not exceeding 30 per cent, together with an oxygen content of from 10 to 20 per cent, reduced the growth of sour orange roots.

Studies in olive production showed the Mission variety to be quite erratic. In certain orchards cross-pollination of the Nevadillo variety promoted regular crops, while in others poor cropping seemed to be associated with a lack of soil moisture.

Records taken on the initial season's production in asparagus plants showed that staminate forms outyielded the pistillate by 35 per cent. Mary Washington was the most prolific variety. Studies with lettuce showed that fertilization occurs about 6 hours after pollination. In favorable condition lettuce seed may ripen in 11 days after anthesis. Observations on numerous spinach varieties showed them to be highly variable and the plants heterozygous for many characters. Selection has yielded uniform strains adapted for canning and other purposes. Sex in spinach was not affected by the time of planting, light intensity, nutrients, or spacing, but is thought to be controlled by genetic factors. Tomato seed produced in different parts of the United States differed in size and weight of individual seeds, but even greater variation occurred in seeds of fruits gathered at different seasons from a single plant. Studies in cucurbit pollination (E. S. R., 54, p. 443) are again discussed.

[Horticultural investigations at the Crookston, Minn., Substation], C. G. Selvig (*Minnesota Sta., Crookston Substa. Rpt. 1924, pp. 9, 58–63, figs. 2*).—As usual (E. S. R., 53, p. 139), brief notes are presented upon the results of extensive variety tests with fruits, vegetables, and flowers.

Report of the horticulturist, W. M. Perry (*Virgin Islands Sta. Rpt. 1925, pp. 6–9, 10–13, figs. 4*).—Although the majority of ordinary vegetables succeed in the Virgin Islands, rhubarb and asparagus failed. A comparison of home-grown and freshly imported seed of six varieties of tomatoes showed but little difference in the quality of fruit produced. Selection through four generations was successful in eliminating black mottled color from the Florida butter bean. Cultural studies with cucumbers and onions indicated that these crops can be grown in a commercial way in the Virgin Islands. Pineapples failed to thrive owing to the calcareous nature of the soil. Eucalyptus, casuarinas, and Honduras mahogany made rapid growth. Studies in mahogany planting indicated that the smaller plants are the best.

Influence of nutrient supply on earliness of maturity in cabbage, J. B. Edmond and E. P. Lewis (*Michigan Sta. Tech. Bul. 75 (1926), pp. 16*).—Dividing the growing period of Copenhagen Market cabbage into three periods, early, intermediate, and late, and applying nutrients in the different periods, the authors found that vegetative growth was accelerated regardless of the time

nutrients were applied. However, the maximum response was obtained from applications during the intermediate period. The ability of cabbage to resume growth after a long and severe check from limitation in food supply is considered to indicate that no bad effects may be expected from extreme hardening prior to planting.

In the case of greenhouse experiments, determinations were made at the end of each of the three periods of the average fresh weight and at the end of the last period of the percentage of water content and dry matter above ground in plants of the various treatments. Plants receiving no nutrients were lowest in fresh weight and high in dry matter, and plants receiving nutrients regularly during the entire growing period had the greatest fresh weight, excepting certain lots which received double portion treatments. Plants receiving no nutrients were lowest and those receiving nutrients throughout the whole season highest in ash, nitrogen, phosphoric acid, potash, and sulfur contents. Plants receiving no nutrients and those which received single treatments in any or all of the three growing periods were higher in total carbohydrates than those which received double treatment at any time. In respect to season of maturity, the plants receiving nutrients throughout the entire season gave the largest number of early well-formed heads.

Studies carried out in the field, in which all plats except the control received equal amounts of fertilizer, differing only in the time and number of applications, indicated the desirability of applying fertilizer in fractional doses rather than in single applications. The plats receiving fertilizer in three applications matured more heads in the early part of the harvesting season than plats receiving fertilizer in one or two applications.

Muskmelons, W. R. Beattie (*U. S. Dept. Agr., Farmers' Bul. 1468 (1926), pp. II+38, figs. 38*).—A general discussion upon the muskmelon industry, with detailed information upon cultural requirements, varieties, control of insect and fungus pests, harvesting, marketing, and economic considerations. The material on insects was contributed by the Bureau of Entomology, and that on diseases by W. W. Gilbert, of the Bureau of Plant Industry.

The budding and grafting of fruit trees (*Maryland Sta. Bul. 278 (1925), pp. 101–147, figs. 36*).—This bulletin is prepared in two parts:

I. *Topworking bearing apple trees*, A. L. Schrader.—Pointing out that topworking becomes a necessity in large blocks of self-sterile or otherwise unprofitable varieties, the author discusses the technique of topworking trees, including the selection of proper limbs, pruning and care of grafted trees, varietal response to grafting, and the treatment of wounds.

II. *Whip and bridge grafting, shield budding, propagation by cuttings, and layerage*, W. E. Whitehouse.—This paper discusses the methods of propagation of fruit trees by grafting, budding, cuttings, and layers.

Apple thinning in Hood River Valley, G. G. Brown (*Oregon Sta. Circ. 76 (1926), pp. 3–10, figs. 2*).—The thinning on July 29 of the fruit upon 11-year-old Ortley apple trees growing under good cultural conditions to 4, 7, and 9 in. apart resulted in average yields per tree of 21.56, 16.1, and 15.5 boxes, as compared with 17.66 for control trees, and in 7.14, 59.85, and 66.1 per cent of apples 125 or less to the box as compared with 2.29 for unthinned trees. However, in respect to monetary returns, the 4-in. thinning alone gave any considerable increase. Thinning of fruit of 15-year-old Yellow Newtown apples to 5, 7, and 12 in. apart resulted in average yields per tree of 27, 25, and 14 boxes compared with 23.5 boxes for control trees. Data furnished by C. L. Long thinning operations in a 12-year-old Winesap orchard showed greater from thinning, due in part to the high color requirements of this

A preliminary report on experiments with fertilizers for peach trees, J. R. COOPER and C. B. WIGGANS (*Arkansas Sta. Bul. 202 (1926), pp. 40, figs. 5*).—A statistical analysis by the Student method of data obtained in a fertilizer experiment with peaches at Lamar showed that nitrogen had a decidedly beneficial effect on the yield and growth, while phosphoric acid and potash had no influence. Although nitrogen applications previous to blooming slightly increased the set of fruit, yields were practically equal, whether the application was made a week before, during, or two or three weeks after blossoming. Applications equal to 2 lbs. of nitrate of soda produced a gain of over 2 bu. of fruit per tree, while larger applications gave no additional benefit. Correlation coefficients of 0.844 and 0.888 were respectively computed between terminal growth and yield of the following season and between terminal growth and trunk growth of the same year. That increased yields were due primarily to increased length of terminal growth was shown in the fact that as many fruit buds formed per unit of length on unfertilized as on fertilized trees, and that the fruit of unfertilized trees was practically as large as that of fertilized trees.

Nitrogen appreciably retarded maturity, the peak of the harvest being delayed from 2 to 3 days. Neither phosphoric acid nor potash used alone, together, or in combination with nitrogen had any effect on color of fruit. It is believed that color is dependent upon the amount of light reaching the fruit. Fertilizers affected hardiness or resistance to frost only as they retarded blooming. Late growth induced by late fertilization was largely barren of flower buds. No differences which could be attributed to fertilization were found in the resistance of peach flowers to frost.

Directions for grading and packing Illinois peaches, J. W. LLOYD (*Illinois Sta. Circ. 310 (1926), pp. 8*).—A presentation of useful information for commercial fruit growers.

Studies relating to the harvesting of Italian prunes for canning and fresh fruit shipment, H. HARTMAN (*Oregon Sta. Circ. 75 (1926), pp. 3–24, figs. 5*).—Observations upon Italian prunes harvested in seven separate pickings, ranging from pre- to post-season dates, and placed for 12 days in storage at a temperature comparable to that of refrigerator cars and then allowed to ripen at 66° showed that the season of picking materially affects the eating and the keeping quality of this fruit. Prunes harvested August 10 required 24 days at 66° to reach full maturity, while those picked August 26 required only 3 days. High edible quality was secured at a sacrifice to keeping quality, but there was found an optimum stage in which the fruit will assume fair dessert quality and yet ship. In prunes designed for the eastern trade this stage is reached when the freshly gathered prunes register between 15 and 12 lbs. under the pressure test.

Records showed that Italian prunes gain rapidly in weight and size when left on the tree until full maturity. At the same time acidity diminishes and sugars increase. In stored fruits there was found a slight decrease in sugars and other solids. Unlike some other fruits, Italian prunes took on color after harvesting. Observations on neighboring prune orchards showed differences in the stage of maturity at any given time.

In canning tests, fruit that was fully ripe yielded by far the best quality product. However, fruit past prime was too dark after cooking. Late picked fruits gave a higher sirup concentration after canning than did those picked and canned early. Fruit of late pickings showed the greatest loss in weight and volume during the canning process. Prunes picked within the desirable range for fresh-fruit shipment and allowed to ripen fully in storage gave a first-class product.

Cuthbert raspberry stock: A comparison of the yields from stock from eastern and southwestern Michigan, S. Johnston (*Michigan Sta. Quart. Bul., 8 (1926), No. 4, pp. 182, 183*).—Observations at the South Haven Horticultural Experiment Station upon the vigor and fruiting capacity of two raspberry stocks, one obtained from the Thumb district of eastern Michigan and the other from southwestern Michigan, showed no differences which could be ascribed to the origin of the plants. The author suggests that the important item in securing raspberry stock is to be reasonably sure that the material is vigorous and free from disease.

Missouri strawberries, T. J. Talbert (*Missouri Sta. Bul. 242 (1926), pp. 28, figs. 17*).—Herein is presented general information on the selection of sites, fertilization and preparation of the soil, intercropping and rotations, varieties, methods of planting, tillage, harvesting, control of pests, etc.

FORESTRY

Forest flora, J. Fitschen (*Gehölzflora. Leipzig: Quelle & Meyer, 1925, 2. ed., pp. VIII+228, figs. 342*).—A small handbook designed to serve as a means for identifying wild and cultivated trees in Germany and neighboring lands.

Long-leaf pine primer, W. R. Mattoon (*U. S. Dept. Agr., Farmers' Bul. 1486 (1926), pp. 38, figs. 23*).—This comprises general information on longleaf pine and discusses such items as soil requirements, reproduction, rate of growth, yields per acre, turpentining, thinning, cutting, yield estimation, protection from fire, hog injury, nursery practices, cost of growing, and possibilities for profit.

Factors determining natural reproduction of longleaf pine on cut-over lands in La Salle Parish, Louisiana, H. H. Chapman (*Yale Univ. School Forestry Bul. 16 (1926), pp. 35, pls. 8*).—Measurements taken in 1924 upon longleaf pine trees discarded during logging operations in 1904 because of their unmerchantable character showed a very marked acceleration in growth following freedom from suppression. The increased volume was estimated as sufficient to return the carrying charges at 6 per cent compound interest, figuring on the acre basis of 11 trees of not over 10 in. diameter. At the same time, data taken on the seeding of the trees showed ample production to assure restocking. Heavy seed years occurred in six to seven year cycles. The percentage of establishment was greatly influenced by the character and the condition of the site. Observations on burned-over areas showed that burning of the ground litter previous to natural seeding greatly increased the percentage of establishment. On Montrose soil, a type favorable to longleaf pine, establishment was much greater than on Myatt, a type preferred by loblolly pine.

The survival of seedlings was hindered by fire, grazing, competing vegetation, and diseases. Longleaf seedlings were observed to be able to withstand spring fires severe enough to cause almost complete defoliation. Hogs were extremely destructive and should be excluded. Restricted cattle grazing was, on the other hand, beneficial, reducing the fire hazard and subduing competing plants. Hardwood sprouts and to a lesser extent seedlings of loblolly pine and shortleaf pine were capable, in the absence of fire and on sites favorable to these species, to suppress longleaf seedlings completely. Even the parent longleaf seed tree must be removed after reproduction is assured. To sum up, the author suggests that (1) reproduction of longleaf pine be confined to typical longleaf sites, (2) the ground be burned over in the spring of the year in which a heavy crop of seed is anticipated, (3) hardwood and chance pine competition be eliminated, and (4) leaf rust, *Septoria pini*, be controlled.

Notes of growth of red spruce in Franklin County, Maine, A. B. Recknagel (*Jour. Forestry, 22 (1924), No. 7, pp. 810, 811*).—Volume and diameter increment tables are presented, based on measurements taken on 83 red spruce trees located in a stand of virgin timber south of Skinner, Me.

Influence of certain soil and light conditions on the establishment of reproduction in northeastern conifers, B. Moore (*Ecology, 7 (1926), No. 2, pp. 191–220, fig. 1*).—Observations upon reproduction on small test plats established in different forest types on Mount Desert Island, Me., showed the inadvisability of seeding directly on humus or under full canopy upon mineral soils. On the other hand, seed spots on mineral soils in openings, even of small size, stood a reasonable chance of success. Red spruce was found superior to white spruce in having a greater shade tolerance and a probable lower water requirement.

Short period evaporation readings showed low rates in spruce and northern spruce-hardwood types, while in the white pine stands evaporation was very high, creating in combination with shade a very unfavorable condition for reproduction. Acidity of the coniferous humus under both white pine and spruce was much higher than under the hardwoods. Records taken on reproduction in flats of soil placed in shade and in the open showed very poor germination and survival in both coniferous and broadleaf humus, a situation due, according to the author, to a combination of insufficient moisture and the inability of the seed to penetrate the surface. The addition of water to the plats under shade failed to counteract the injurious effects of the canopy, showing that water has relatively little power to overcome the adverse influence of heavy shade. Exposure of mineral soil under spruce was successful, and may be used to supplement natural reproduction except on dry sites.

The determination of viability of seed by reagents [trans. title], K. Hasegawa (*Forest Expt. Sta. [Japan], Bul., 1 (1925), No. 1, pp. 1–16, pl. 1*).—The close correlation recorded between the results of actual germination tests and data obtained in determinations of peroxidase activity in freshly broken seeds as revealed by the guaiacum reaction leads the author to suggest that this latter method may be profitably applied by foresters and seed dealers as a rapid means of determining the viability of forest seeds. In 26 of 40 tests with *Chamaecyparis obtusa* the chemical determinations gave slightly higher readings than actual germination. However, in most cases the difference was less than 3 per cent. Other forest species utilized were *C. pisifera*, *Cryptomeria japonica*, *Pinus densiflora*, and *P. thunbergii*.

Forestry nursery practice, P. A. Herbert (*Michigan Sta. Quart. Bul., 8 (1926), No. 4, pp. 185–187, fig. 1*).—This brief article relates to the sowing of forest seeds and their care during the seedling stage. A tabulated list is given of the number of seeds per pound and the percentage of germination for a large number of species common to Michigan.

Fertilizing the forest nursery, P. A. Herbert (*Michigan Sta. Quart. Bul., 8 (1926), No. 4, pp. 188–192, fig. 1*).—Of 52 fertilizer combinations tested upon forest seedling plats, poultry manure was most effective, followed by horse manure and by a complete mineral fertilizer. The animal manures were particularly effective in aiding the development of a bushy root system able to withstand droughts and transplanting.

Forest finance, H. H. Chapman (*New Haven, Conn.: Tuttle, Morehouse & Taylor Co., 1926, pp. XIII+352, figs. 15*).—Superseding an earlier publication (E. S. R., 32, p. 840) entitled Forest Valuation, this text has been entirely rewritten and considerably enlarged to include new developments and knowledge.

State forestry laws of 1922 and 1923, J. S. Peyton (*U. S. Dept. Agr., Dept. Circ. 359 (1926), pp. 41*).—A general survey of State legislative activities pertaining to forestry during the years 1922 and 1923, with a summary of the more important provisions arranged according to States.

New York forestry year book, 1926, edited by J. R. Simmons (*Albany: N. Y. State Forestry Assoc., 1926, pp. 40, figs. 9*).—This report, covering the proceedings of the fourteenth annual meeting of the New York State Forestry Association, includes the following papers: New Ways to Start New Forests (pp. 16, 17, 28) and In Memoriam, Five Leaders in the Field of Forestry (pp. 33–35), both by R. S. Hosmer, of Cornell University; and The Wood Utilization Conference at Syracuse and Its Aftermath, by A. B. Recknagel, of the same institution (pp. 20–22).

Report on the forests of British Honduras, with suggestions for a far reaching forest policy, C. Hummel (*Belize: Brit. Honduras Forest Office, [1926], pp. VI+122, pl. 1*).—Information is offered on the present status of forests and forestry in British Honduras, with suggestions for the development of an adequate forest policy and a strong forest organization.

DISEASES OF PLANTS

Plant pathology [at the California Station] (*California Sta. Rpt. 1925, pp. 58, 59*).—The pathological investigations briefly summarized in this report include studies of the Armillaria root rot of fruit trees, in which the life history of the fungus and resistance of possible root stocks are considered; brown rot of apricots, in which there was opportunity to confirm previous conclusions; soft rot of figs, which is caused by a fungus carried by the Blastophaga insect; souring of figs caused by a yeast introduced by the dried fruit beetle; bacterial gummosis of fruit trees, which is greatly influenced by climatic factors; a tipburn of lettuce that is considered of a physiological nature; tomato wilt caused by a fungus of the Verticillium type instead of being due to a Fusarium as usually reported, the same fungus also causing a black heart disease of young apricot trees; and strawberry yellows, which is claimed to be an insect-transmitted disease of the virus type.

Plant pathology [at the Citrus Experiment Station] (*California Sta. Rpt. 1925, pp. 41–43*).—A study of some new or little known types of citrus fruit rots and spots by H. S. Fawcett revealed the occurrence of rots due to *Trichoderma lignorum* and *Fusarium* sp., and a pink mold caused by *Penicillium roseum*. The causal relationship of Diplodia and Dothiorella to forms of gummosis was also determined.

A bacterial organism isolated by C. O. Smith from avocados was found to resemble the citrus blast organism and also one recently isolated from diseased lilac twigs.

In continuation of investigations previously reported (E. S. R., 53, p. 449), the crown rot of walnuts has been definitely connected with Pythiacystis-like organisms, of which there are at least two distinct types. Inoculation experiments showed that the southern California black walnut is very susceptible to the disease, while the northern black walnut and the English walnut have about equal degrees of resistance.

Further studies of the internal decline of lemons, a physiological trouble for which the name endoxerosis is proposed, are said to have shown that a water deficit may exist in lemon fruits over periods of from several days to two and a half weeks. Auxographic measurements, as well as the use of potometers and forcing gas through the vessels, showed that the rates of

entrance of water into the fruits and exit from them are retarded by a factor in the vessels of the branches bearing the disease. Sectioning and staining of portions of these twigs showed that many of the water-conducting vessels were clogged with gum, which appeared to have been formed in the fruit and then carried or forced back into the twig.

Plant diseases (*Connecticut State Sta. Bul. 274 (1926), pp. 198, 199, fig. 1*).—For the control of celery blight Bordeaux mixture is said to be more effective than applications of fungicides in dust form.

As a result of several years' study it has been found that the black root rot of tobacco is caused by *Thielaviopsis basicola*. This is a fungus distinct from *Thielavia basicola*, which was formerly considered to be the ascospore stage of the fungus.

Plant pathology and physiology (*Texas Sta. Rpt. 1925, pp. 32-34*).—In continuation of previous studies (E. S. R., 54, p. 346), additional data were secured relating to the cotton root rot, its hosts, and control. Experiments are said to indicate that more than four years' clean fallow is necessary to destroy the fungus in the black lands of Texas, hence ordinary rotations will not control the disease. A count made in a field of oat stubble in a three-year rotation of cotton, corn, and oats showed 102,864 seedlings and 5,814 old plants of *Ipomoea trichocarpa* per acre, all of which were carrying the root rot fungus. Similar conditions prevailed in a four-year rotation. Sulfur applied at the rate of 10,000 lbs. per acre reduced root rot, but such treatments are not considered desirable. Studies made at some of the branch stations are said to have revealed weed hosts of the fungus differing from those at the central station. In laboratory experiments the fungus was inhibited in growth by 0.2 per cent normal hydrochloric acid, 0.21 per cent normal sulfuric acid, and 5.5 per cent normal sodium hydroxide. The spores of the root rot fungus were successfully germinated during the year. It is said that they appear to be covered with a waxlike layer which prevents the absorption of water, but when water is absorbed the spores germinate quickly.

Experiments with sulfur for the control of diseases of cantaloupes and cucumbers showed that under the conditions of the experiment sulfur in its present form should not be used on account of the burning of the foliage.

A study of tomato diseases in east Texas is said to indicate that that crop is practically undamaged except for Fusarium wilt and blossom-end rot.

A spinach disease reported in 1924 has been found to be caused by *F. solani*.

[Report of] division of plant pathology, W. G. FREEMAN (*Trinidad and Tobago Dept. Agr. Rpt. 1923, pp. 14, 15*).—Sugar cane showed no pronounced or extensive fungus injury. Mosaic was kept under control by periodical inspection and roguing. Blight outbreaks were sporadic, affecting chiefly Uba cane, but lessening in December. Cacao black pod showed increase. Coconut failure is described as occurring at various places in the colony. Coconut little leaf appears to be curable (when not in an acute stage) by pouring slowly into the crown disinfectants in fairly heavy doses, the three mentioned being nicotine sulfate (1-500), limewater, and formalin (0.5 per cent). Stem bleeding disease is still prevalent in places. The remedy is to excise diseased tissues and coat the exposed surfaces with a preservative. The red ring disease, due to nematodes, is by far the most devastating. No cure is known, but prompt isolation by trenches prevents its spread. Affected trees should be burned intact to prevent the spread of nematodes in the chips.

Mycological work in Egypt during the period 1920–1922, H. R. BRITON-JONES (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 49 (1925), pp. VII+129,*

pls. 11).—This bulletin deals in greater or less detail with cotton sore shin, root rot, angular leaf spot, a boll wound parasite (not named), Fusarium wilt, and a physiological wilt; broad bean (*Vicia faba*) rust (*Uromyces fabae*) and downy mildew (*Peronospora viciae*); French bean (*Phaseolus vulgaris*) rust (*U. appendiculatus*); cowpea rust (*U. appendiculatus*); garden pea downy mildew (*Peronospora viciae*) and powdery mildew (*Erysiphe polygoni*); barley covered smut (*Ustilago hordei*), loose smut (*U. nuda*), black rust (*Puccinia graminis*), yellow rust (*P. glumarum*), stripe disease (*Helminthosporium gramineum*), and late blight (*H. teres*); oat smut (*U. avenae*) and black rust (*P. graminis*); maize rust (*P. maydis*) and leaf blight (*H. turcicum*); millet (*Andropogon sorghum*) grain smut (*Sphacelotheca sorghi*), head smut (*U. reiliana*), and long smut (*Tolyposporium filiferum*); wheat black rust (*P. graminis*), yellow rust (*P. glumarum*), orange rust (*P. triticina*), loose smut (*U. tritici*), mold (*Mycosphaerella tulasnei*), bacterial disease (*Pseudomonas tritici*), and bunt (*Tilletia levis*); beet leaf spot (*Cercospora beticola*); turnip leaf blight (*Alternaria brassicae*); globe artichoke powdery mildew (*Oidiopsis taurica*) and root rot (*Sclerotium rolfsii*); cabbage downy mildew (*Peronospora parasitica*); celery leaf spot or early blight (*Cercospora apii*); eggplant powdery mildew (*O. taurica*); lettuce downy mildew (*Bremia lactucae*); potato ring disease (*Bacillus solanacearum*); purslane white rust (*Cystopus portulaceae*); spinach downy mildew (*Peronospora effusa*); tomato fruit rot (*Macrosporium tomato* and *Alternaria solani*); okra (*Hibiscus esculentus*) powdery mildew (*E. cichoracearum*); almond (*Prunus communis*) rust (*Puccinia pruni-spinosae*); citrus withertip (*Colletotrichum gloeosporioides*), dieback or exanthema, sun scorch, black rot (*A. citri*), Penicillium rot (*P. italicum* and *P. digitatum*), sooty mold (*Capnodium citricolum*), gummosis, and melanose (*Phomopsis citri*); date leaf smut (*Graphiola phoenicis*); fig rust (*Uredo fici*); grape (*Vitis vinifera*) downy mildew (*Plasmopara viticola*) and leaf spot (*Cercospora viticola*); mango mildew (*Oidium mangiferae*) and blight (*B. mangiferae*); peach leaf curl (*Exoascus deformans*) and gummosis; plum powdery mildew (*Podosphaera oxyacanthae*); strawberry leaf spot (*Mycosphaerella fragariae*); castor oil plant rust (*Melampsorella ricini*); darnel grass (*Lolium temulentum*) fungus (not named); *Imperata cylindrica* smut (*Sphacelotheca schweinfurthiana*); *Melilotus* spp. downy mildew (*Peronospora trifoliorum*); opium poppy (*Papaver somniferum*) downy mildew (*Peronospora arborescens*); rose mildew (*Sphaerotheca pannosa*), rust (*Phragmidium subcorticium*), and leaf blotch (*Actinonema rosae*); sugar cane mosaic (cause unknown); and poplar bracket fungus (*Polyporus hispidus*) and root rot (*Armillaria mellea*).

A bibliography of 40 titles is given.

Work connected with insect and fungus pests and their control, A. J. Brooks (*Gambia Dept. Agr. Ann. Rpt. 1924, pp. 13–15*).—Brief accounts are given regarding peanut leaf spot (*Cercospora personata*), wilt (*Fusarium* sp.), and root disease (*Sclerotium rolfsii*), and sorghum rust (*Puccinia purpurea*).

History of the introduction of new plant diseases [trans. title], E. Foëx (*Rev. Bot. Appl. et Agr. Colon., 4 (1924), No. 37, pp. 581–588*).—A few outstanding diseases of plants are treated historically.

Culture studies with Fusariums in nutritive solutions differing as to H-ion concentration [trans. title], T. Lindfors (*Bot. Notiser, 1924, No. 2, pp. 161–171, figs. 4*).—For all Fusariums tested the growth optimum, though not the same, lay on the acid side of the neutrality point, usually with a steep curve slope beyond that point.

The importance of the Rhizoctonias [trans. title], J. Costantin (*Ann. Sci. Nat., Bot., 10. ser., 6 (1924), No. 5-6, pp. I-XV, figs. 2*).—This is largely a bibliographical discussion.

Mycorrhizas and plant pathology [trans. title], J. Costantin (*Rev. Bot. Appl. et Agr. Colon., 4 (1924), No. 36, pp. 497-508*).—Calling attention to statements by himself (E. S. R., 49, p. 822; 51, p. 227) and by other writers reporting or discussing recent developments, the author claims that consideration of facts set forth in the present article in regard to mycorrhizas on various plants is necessary to the formation of a theory agreeing reasonably with facts observed in case of a large number of plants in various countries, both tropical and temperate.

Soil reaction and some diseases of agricultural plants [trans. title], L. Petri (*Nuovi Ann. Agr. [Italy], 4 (1924), No. 2, pp. 248-251*).—It is regarded as evident, from consideration of facts and views presented, including those by Hudig, previously noted (E. S. R., 52, p. 645), and those of Melin, noted on page 350, that study of soil reaction from a chemical viewpoint must be supplemented by adequate attention from the viewpoint also of agricultural microbiology and phytopathology.

The effects on plants of claying and sanding cultivated peaty soils, I-III [trans. title], E. Henning and O. Arrhenius (*Meddel. Centralanst. Försöksv. Jordbruksområdet [Sweden], Nos. 214 (1921), pp. 36, pls. 2, figs. 4; 226 (1921), pp. 14, pl. 1, figs. 2; 264 (1924), pp. 24, pl. 1, figs. 3*).—The first two of these reports, by Henning, are claimed to show the beneficial results of claying peaty soils to prevent oat yellow leaf tip. The third report, by Henning and Arrhenius, deals with the causes of this disease, which manuring does not prevent. Liming is preventive in some cases, not in all. Some details are given of investigations on the physical properties of clay, peat, and mixtures. It is stated that the disease is not due, as has been claimed, to high soil acidity.

By claying a peat soil some of the water conditions are improved and some are not. It seems that the physical conditions of the soil, the temperature, or the acidity may have no great influence on the causes of the disease. The oxidation-reduction potentials may be the cause, but as the methods are not yet quite perfected this question must still be left open.

In an experiment with pure peat to which were added different amounts of superphosphate, no disease was present on the untreated peat or on the peat with the lowest amount of phosphate. On the other hand, the other two treatments produced strongly diseased plants, and the peat that had received the greatest amount of superphosphate was most diseased. This experiment shows what all the other data have indicated, namely, that the high content of phosphates in the soil solution seems to be one of the most prominent factors in causing the yellow leaf-tip disease of oats.

The action of carbon disulfide in plants [trans. title], A. Curini-Galletti (*Staz. Sper. Agr. Ital., 57 (1924), No. 1-3, pp. 131-137*).—From the data obtained and tabulated, the author argues an increase in growth as regards length of hypocotyl and augmentation of weight corresponding to carbon disulfide application in aqueous solution in case of *Zea mays*, *Pisum sativum*, *Triticum vulgare*, *Cannabis sativa*, *Trifolium pratense*, *Medicago sativa*, and *Solanum lycopersicum*.

Plant seed disinfection [trans. title], J. Dufrénoy (*Rev. Bot. Appl. et Agr. Colon., 4 (1924), No. 30, pp. 81-87*).—Facts, figures, and formulas are briefly presented relating to seed disinfection treatments, including heat, ultra-violet irradiation, and chemical action, this account dealing also with bulb nematodes and other animal pests.

[Experiments on bunt control] (*California Sta. Rpt. 1925, p. 36*).—W. W. Mackie and F. N. Briggs tested 39 solutions and dusts for the control of seed-borne bunt. Standard copper carbonate dusts compared favorably with the standard fungicidal solutions. Of the mercury compounds tested Dupont S. D. No. 5 is said to have been the most efficient in controlling bunt, even exceeding copper carbonate in this respect. Some of the mercury compounds are reported to have exerted beneficial effects on seed germination.

Rust of cereals, W. M. Carne and J. G. C. Campbell (*West. Aust. Dept. Agr. Bul. 126 (1924), pp. 10, figs. 5*).—Wheat stem, black, or summer rust (*Puccina graminis*) occurs wherever wheat is grown. In New South Wales rust has rendered grain growing on coastal areas unprofitable and in the epidemic year of 1916 is said to have cost more than £2,000,000. Oat stem rust (*P. graminis avenae*) is less serious, though occurring also on wild black oats. Wheat leaf or spring rust, not yet recorded for Western Australia, is common in the eastern portions, though not so serious as stem rust. The life histories of the leaf rusts do not differ, generally, from those of the stem rusts. The secondary host for wheat leaf rust is *Thalictrum* spp., and for oat leaf rust it is *Rhamnus* spp., these plants taking the place of the barberry in stem rust. The aecidial stages are not known in Australia.

Black stem rust and the progress of barberry eradication in Wisconsin, W. A. Walker and N. F. Thompson (*Wis. Dept. Agr. Bul. 68 (1925), pp. 24, figs. 8*).—Black stem rust has caused heavy losses of all grains in the north-central part of the United States, the common barberry being the important factor in the distribution of this rust. The cost of barberry eradication to date has been less than 3 cts. per acre of small grains raised in the State in a single year.

Smut treatment tests, C. G. Selvig (*Minnesota Sta., Crookston Substa. Rpt. 1924, p. 32*).—In 1922 and 1923 tests were made of formaldehyde, Chlorophol, Seed-O-San, and copper carbonate as treatments for the prevention of smut in wheat, oats, and barley.

Copper carbonate and Seed-O-San were found effective for the control of smut in wheat but not so effective as formaldehyde, especially for oats and barley. Formaldehyde reduced the yields of wheat by 3.6 bu. and of oats by 4.7 bu. less than untreated seed, but it controlled the smut. Copper carbonate was not quite so effective in controlling smut as formaldehyde, but in the two years it was used it did not reduce the yield but rather increased it.

The contest with Berberis in Denmark and its result [trans. title], C. Ferdinandsen (*Nord. Jordbrugsforsk., 1924, No. 2–3, pp. 221–235, fig. 1*).—An account extending back as far as the year 1800 is given of Berberis and grain rust in Denmark.

A physiological disorder of flax on peat soils [trans. title], H. Witte (*Svenska Mosskulturför. Tidskr., 38 (1924), No. 1, pp. 4–18, figs. 8*).—Condition and growth of flax on peat soils were greatly improved by the addition of lime, sand, or clay.

Peanut rosette [trans. title], A. Kopp (*Rev. Bot. Appl. et Agr. Colon., 4 (1924), No. 30, p. 129*).—A rosette disease of peanut is mentioned as existing in southern Africa, also in Nigeria and in the Tanganyika region.

Experimental culture of potato with an endophyte [trans. title], J. Magrou (*Ann. Sci. Nat., Bot., 10. ser., 6 (1924), No. 5–6, pp. 285–288*).—In a discussion, partly controversial, of his own work and conclusions, the author notes the coincidence of potato tuberization with the presence of living endophytes and of nontuberization with early destruction of the same endophytes.

[Potato disease control investigations], C. G. Selvig (*Minnesota Sta., Crookston Substa. Rpt. 1924, pp. 48–51*).—Summarizing the results of three

years' experiments with sulfur as a soil treatment for the prevention of potato scab, the author reports that the control of scab during 1923 and 1924 varied from 22 to 40 per cent. Soil moisture conditions during the period of tuber development are considered of greater importance in scab control than the chemical content of the soil. The author states that little, if any, effect in yield can be expected the first year of sulfur soil treatment.

Seed tuber treatments with corrosive sublimate, hot formaldehyde, and copper carbonate in 1924 are reported upon. Conditions are said to have been unfavorable for infection by scab and black scurf. Differences in effectiveness of hot formaldehyde and corrosive sublimate were very slight. Plants from seed treated with copper carbonate are reported to have been slow in germination and slower in development than those on the other plats, although late in the season the vine growth was about the same as on the other plats.

Comparisons were made in 1924 of commercial and homemade Bordeaux mixture applied as dust and as liquid sprays. It is claimed that the value of Bordeaux mixture as a potato spray was demonstrated. The best and most economical returns came through three applications of Bordeaux mixture to which lead arsenate was added. Homemade Bordeaux mixture is said to be much cheaper than the commercial brands, especially for large fields.

Fungi and bacteria in sugar and sugar cane, P. A. van der Bijl (*So. African Sugar Jour., Cong. and Exhib. No., 1923, pp. 51–53*).—No bacterial cane disease having been as yet recorded for Natal and Zululand, the author dealt with various fungus diseases and the causal organisms, including root disease (*Himantia stellifera*), rind disease (*Melanconium sacchari*), stalk red rot (*Cephalosporium sacchari*), and eye-spot leaf disease (*Leptosphaeria sacchari*). Fungi and bacteria as causes of loss in mills and storehouses were also discussed, with notation of Penicillium and *Aspergillus* spp. as mold fungi commonly causing loss.

The major cane diseases, H. Storey (*So. African Sugar Jour., Cong. and Exhib. No., 1923, pp. 54–61, figs. 12*).—Uba is the only cane variety that is largely planted locally, and this variety is said to suffer in very small degree from the diseases which may be very prevalent elsewhere. The author, therefore, discussed chiefly the symptoms and chief characteristics of some of the more serious diseases occurring in other cane-growing countries, namely, sereh, Fiji, and mosaic.

Sugar cane diseases in the South, W. Cottrell-Dormer (*Aust. Sugar Jour., 16 (1924), No. 9, pp. 596, 597, 604, 605, figs. 5*).—At Mount Bauple, actual observation was made of only one important infectious cane disease, namely, mosaic, though mention is made also of knife cut disease and "foot rot," *Marasmius* sp. (*M. sacchari*?). In the Isis district, the more serious diseases included gumming, mosaic, acute root disease, and one resembling iliau (*Melanconium iliau*?), if not identical therewith.

A new method of fighting the propagation of mosaic disease in sugar cane, J. Alfaro (*Planter and Sugar Manfr., 75 (1925), No. 20, pp. 388, 389; abs. in Agr. Soc. Trinidad and Tobago Proc., 25 (1925), No. 2, pp. 437–439*).—Mosaic is carried in ratoons, but it is transmitted also and chiefly by insects while the growing portions of the plant are very young, and consequently very susceptible to attack by insects, and while these carriers are abundant and active, as during the period from March to July. The insects are present in cool fall weather in egg form only, and uninfected canes planted at that time are found to remain entirely free from mosaic. Such canes, by the time the insects are ready to attack in spring, are too old to be attacked severely, if at all. Ratooning in fall and not in spring, therefore, is thought to offer the best method for control of cane mosaic in Cuba.

Arsenical injury to peach, C. W. BENNETT (*Michigan Sta. Quart. Bul.*, 8 (*1926*), *No. 4, pp. 183–185, fig. 1*).—Attention is called to the injury to peach trees following the application of fungicides or insecticides which contain arsenic, particularly applications of lime sulfur to which lead arsenate is added. For the prevention of injury the author recommends that an excessive amount of arsenate of lead should not be used in spray mixtures, and that when lead arsenate is used as many pounds of lime as of sulfur should be employed.

Treatment for grape mildew [trans. title], E. VIVET (*Soc. Agr. Algérie* [*Pub.*] *463, pp. 12*).—Grape mildew, appearing in a violent outbreak in 1921, very light attacks in 1922, and severely in sporadic instances in 1923 at places named, is dealt with in a comparative manner as regards appearances, varietal resistance, and treatments which are discussed as to their applicability in given circumstances.

A banana disease caused by a species of Heterodera, T. FAHMY (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 30* (*1924*), *pp. 11, pls. 9*).—Of 70 banana plantations in Upper and Lower Egypt and in the Alexandria district, visited in the autumn and winter of 1921–22, not one was free from plants bearing root galls. These were ascribed to a Heterodera, agreeing in some respects with *H. radicicola*, but lacking the spearlike piercing mouth organ developed at a certain stage by that nematode. Suckers sold for planting were rarely free from the cysts on their roots. No sucker plantation examined, either at Belbeis or Ismailia, was free from the parasite. All the varieties, including Hindi (*Musa cavendishii*), Baladi (*M. sapientum*), and Americani (*M. sapientum paradisica*), were susceptible. Experimentation looking to control is contemplated.

Wither tip of limes in Dominica, F. STELL (*Agr. Soc. Trinidad and Tobago Proc.*, *24* (*1924*), *No. 4–5, pp. 181–185*).—The growing of limes, said to constitute the only agricultural industry of importance in Dominica and occupying in all from 5,000 to 6,000 acres, is said to produce far below the capabilities of that area, chiefly on account of the withertip anthracnose (*Gloeosporium limetticolum*), which is favored by the prevalent practice of too close spacing (from 12 to 20 ft.). Successful prosecution of the lime industry is held to require careful and continuous cultivation, substitution after successful experimentation of immune varieties, and alternation of croppings where necessary.

A destructive fungus on palms [trans. title], A. ROBERTSON-PROSCHOWSKY (*Rev. Bot. Appl. et Agr. Colon.*, *4* (*1924*), *No. 30, pp. 106–109*).—A fatal disease of palm trees, noted in Côte d'Azur, is briefly discussed. *Penicillium roseum coremioides* has been found in connection with the conditions mentioned.

Root diseases of tea and rubber [trans. title], C. BERNARD (*Thee* (*Alg. Proefsta. Thee* [*Buitenzorg*]), *5* (*1924*), *No. 3, pp. 75–79*).—Tea and rubber diseases, with their causal fungi, are briefly discussed in connection with interests more or less local.

Chestnut black canker [trans. title] (*Nuovi Ann. Agr.* [*Italy*], *4* (*1924*), *No. 2, pp. 276–289, figs. 5*).—L. Petri is credited with this compilation of information to be used as a basis of practical instruction looking to the recognition and control of chestnut black canker, which, originating supposedly in the Azores, has spread extensivley and threateningly on the mainland to the east.

The influence of H-ion concentration on the activity of root fungi of pine and fir [trans. title], E. MELIN (*Bot. Notiser, 1924, No. 1, pp. 38–48, fig. 1*).—Of the factors supposed to influence the development and activity of symbiotic root mycorrhizas of conifers, the author studied the H-ion concen-

tration and found that mycorrhizal growth was poor at pH 3.5 and at pH 7, with an optimum about pH 5 or slightly below that point.

Conifer mycorrhiza fungi and their significance [trans. title], E. MELIN (*Skogsvårdsför. Tidskr., 22 (1924), No. 6–7, pp. 197–221, figs. 27*).—Conifer root mycorrhizas are deemed of importance in most of the Swedish forests.

The mycorrhiza fungi of Pinus montana [trans. title], E. MELIN (*Bot. Notiser, 1924, No. 1, pp. 69–92, figs. 7*).—Detailed results are given of studies, chiefly experimental, of certain conifers and mycorrhiza-forming fungi. Culture studies have been projected regarding the ability of *P. montana* mycorrhiza to fix atmospheric nitrogen.

Significance of conifer rots and their control [trans. title], T. LAGERBERG (*Skogsvårdsför. Tdskr., 21 (1923), No. 11–12, pp. 313–345, figs. 26*).—Information is given regarding the significance to conifer wood production interests of deteriorating fungi, including *Polyporus* spp., *Armillaria mellea*, *Stereum sanguinolentum*, and *Corticium evolvens*.

Storage rots [trans. title], T. LAGERBERG (*Skogsvårdsför. Tidskr., 22 (1924), No. 8–9, pp. 231–249, figs. 3*).—An outgrowth and expansion is detailed of studies previously noted (E. S. R., 45, p. 357). The present account deals with *Corticium evolvens*, *Stereum sanguinolentum*, and other fungi named in connection with timber or lumber rots.

A disease of Syringa vulgaris [trans. title], C. MASSALONGO (*Bul. Soc. Bot. Ital., No. 8–9 (1924), pp. 162–164*).—A disease, supposedly new, of lilac in Verona is reported, with partial description.

Fungicidal action by the tubers of Ophrydeae [trans. title], J. MAGROU (*Ann. Sci. Nat., Bot., 10. ser., 6 (1924), No. 5–6, pp. 265–270, fig. 1*).—Work is outlined as bearing largely on matters studied by Bernard (E. S. R., 22, p. 722; 27, p. 224) regarding the fungicidal action of tubers of certain orchids, notably *Orchis* sp. or *Loroglossum hircinum*.

ECONOMIC ZOOLOGY—ENTOMOLOGY

The Zuni prairie dog in Montezuma County, Colorado, W. L. BURNETT and S. C. MCCAMPBELL (*Colo. State Ent. Circ. 49 (1926), pp. 15*).—This is an account of the life history and habits of *Cynomys gunnisoni zuniensis* and means for its control. This prairie dog was successfully poisoned during the season of 1925 with 1 oz. of strychnine to 16 qt. of oats. It is pointed out that a decided tolerance for strychnine may be built up if the dog begins by taking less than a lethal dose, by the use of too little or too weak a poison, or by rains weakening a strong poison.

Making use of our birds, O. A. STEVENS (*North Dakota Sta. Bul. 195 (1926), pp. 30, figs. 2*).—The author discusses the value of birds, their seasonal occurrence, food, damage caused, protection, North Dakota birds, etc., and gives a spring migration list and an index to the birds described or mentioned. Some 320 kinds of birds have been recorded in the State, the greater part of which are summer residents, a few are permanent residents, a few winter visitants, and some are seen only during spring and fall migration.

[Entomological work at the California Station] (*California Sta. Rpt. 1925, pp. 43, 44–46, 51–53*).—Reference is first made to fumigation work with hydrocyanic acid, by H. J. Quayle and H. Knight, a report upon which has been noted (E. S. R., 53, p. 453). In work with sprays for scale insects of citrus trees 11 different fractions of lubricating oils and 4 kerosenes were tested. A highly refined lubricating oil was found the most effective against red scale, and the safest from the standpoint of oil injury. Fatty acids separated from soaps showed a much greater toxicity than the same amounts combined in

the form of a soap. Mealybugs used as test insects remained alive in a highly refined lubricating oil for 10 days, and were killed in kerosene in a few hours. However, because of the difference in volatility, pure kerosene when sprayed on the tree failed to give a satisfactory kill of the red scale, while as low as 2 per cent of the lubricating oil gave a satisfactory kill under the same conditions. A quick-breaking emulsion gave better results than the same amount of oil in a stable emulsion. Reference is made to work with the codling moth in walnuts, an account of which by Quayle has been noted (E. S. R., 55, p. 156).

Reporting upon the introduction of beneficial insects, under the direction of H. S. Smith, it is stated that the lady beetles *Chilocorus kuwanae* Silv. and *Notolipernes* sp., which are scale feeders, the latter particularly on the red scale, and *Leis* sp., a voracious enemy of aphids, have been introduced and give promise of being of value in the control of citrus pests. *C. kuwanae* has already been recovered from the citrus orchards in Santa Barbara County, and appears to be established. Several other species of lady beetles and several other true parasites of scale insects have been received, the most promising being *Casca* sp., and *Comperiella bifasciata* How., both internal parasites of the California red scale. The black scale parasite *Anysis saissetiae* (Ashm.), received from China, and the two internal parasites of this scale *Coccophagus modestus* Silv. and *C. trifasciatus* Comp. have been recovered in the open, indicating their establishment.

Notes are presented on the status of studies of the orange Tortrix (*T. citrana* Fern.). Native parasites were sufficiently abundant during the last two summers to hold this pest in check. In a survey of 29 localities in southern California, in the spring of 1925, the total parasitism of the orange Tortrix found was 72.13 per cent, and *Apanteles aristotelidae* was responsible for 74 per cent of this total. On June 9 the parasitism was 90 per cent at La Verne.

Studies made of the life history of the mealy plum aphid indicate that in most instances the insect does not winter in the egg stage on prunes and plums, but migrates from tules and reed grasses to the orchards in the spring and back again in the fall. Soap sprays gave the best control when thoroughly applied. Soil fumigants failed to give satisfactory control of the garden centipede, *Scutigerella immaculata* (Newp.), in asparagus fields, but flooding in the Delta region proved very successful during the past two years. Effective control of the sugar beet armyworm in fields of young cotton in Kent County was obtained by drilling in the rows standard sweetened and poisoned bran mash. Brief reference is made to work with the beet leafhopper.

A comparative study was made of the insecticidal properties of various species of Derris (E. S. R., 53, p. 52). The percentage of active principle as extracted by ether was as follows: *D. elliptica* roots 1.85 per cent and trunk 2.26 per cent, *D. heptaphylla* roots 4.2 per cent, *D. polyantha* roots 3.16 per cent and trunk 2.95 per cent, and *D. trifoliata* roots 2.31 per cent and trunk 3.25 per cent.

Studies of the action of potassium xanthate show that its principal value as a fumigant lies in its decomposition product carbon disulfide. The xanthates may be used alone as a soil fumigant, but are more effective in an acid medium.

Work with American foulbrood (E. S. R., 55, p. 258) is referred to.

[Report of work in entomology at the Texas Station] (*Texas Sta. Rpt. 1925, pp. 19–24*).—In aphid studies, in charge of H. J. Reinhard, it was found that cold is no more of a factor than heat in producing winged forms, large numbers of alate forms having been produced in cages where the temperature rose to 110° F. The maturity of the cotton plants is evidently not a factor,

for when the lice are abundant the winged forms appear in large numbers on young cotton plants as well as on the mature plants.

In observations of the ingestion of poison by the boll weevil, in charge of F. L. Thomas, it was found that in moving about the plants the weevil touches the surface frequently with the tip of its beak. Particles of dust or other foreign substances may be picked up by the mandibles, which continually work back and forth as the weevil moves about. Although well fed, paralysis and death will begin to occur among weevils allowed to travel over a glass surface which has been subjected to the dust cloud in from 3 to 8 hours. In larger scale operations, in which 750 weevils were used in three experiments, an average of 25 per cent were killed during the first 24 hours in cages where the entire plants were dusted, and on the following four days the average percentages killed were 36, 14, 13, and 9, respectively.

In hibernation studies, in charge of E. Hobbs, boll weevils were first removed from the cage on March 10, and the last one emerged June 29. On April 12, 50 per cent of the emergence had taken place. The survival was 6.4 per cent.

Studies by Thomas and Reinhard of the life history of the cotton hopper (*Psallus seriatus*), previously reported from Texas, Georgia, and South Carolina (E. S. R., 52, pp. 454, 553), are considered to have been the most important work of the year. In cage experiments, in which 10,000 adults and 3,000 nymphs were used, it was found that the nymphs are capable of producing greater injury than the adults, and that nymphs obtained from horsemint caused more injury than nymphs obtained from Croton. Where the nymphs lived and were recovered in the cheesecloth sacks, the terminal bud which would produce a leaf was almost invariably injured, and similar injury could also be produced by confining adults under lantern globes.

"The egg stage of the insect has been found in the tender growth of cotton plants, five species of Croton, and two species of Monarda. Eggs have been found in remnants of cotton stalks which were broken up and plowed under during the winter and then brought to the surface by cultural operations in spring. Croton plants which are permitted to grow in late summer and fall contain large numbers of eggs, and where weedy and neglected fields are planted to cotton the following spring injury by the cotton hopper is very likely to develop. The overwintered eggs first began to hatch on April 2 and continued until the middle of May, though 58 per cent of the nymphs from overwintered eggs hatched before the first of May. Adults were first found in the field on Croton weeds on April 21. The insects remained on these weeds, gradually increasing in numbers and reaching the maximum in September. There was no migration from Croton weeds to cotton. The infestation on cotton in the vicinity of College Station was so light that the crop was not materially damaged. The life history may be briefly stated as follows: When laying eggs, the female pierces the plant tissue of the tender stems by means of her ovipositor. In the laboratory, a maximum of 11 eggs were laid during a 24-hour period. The maximum number produced during the life of a single pair was 34 eggs. They are laid singly. The egg stage averages 7.8 during the active period, varying from 6 to 11 days. There are five instars, or nymphal stages, of which drawings have been made. The average length of each nymphal period varies from 1.5 to 2 days in summer. Complete development from hatching to adult stage occurs in from 7 to 10 days, but in fall may require 5 to 6 weeks. The generations are not distinct, as there is great overlapping."

In control work, in which 13 tests were conducted near College Station, using the dust form of flowers of sulfur, superfine dusting sulfur, sulfur

naphthalene, sulfur lime, copper lime, calcium fluosilicate, derrisol spray, and nicotine sulfate spray, it was found that any of them would reduce the infestation, but that best results were obtained from those containing sulfur. Sulfur naphthalene gave better control than straight sulfur, but none of the dusts appeared to have killed the adult insects. The immature stages of the cotton hopper are most susceptible, an average of 92 per cent control having been obtained with sulfur naphthalene and 85 per cent with sulfur.

In investigations by Thomas and W. H. Friend, it was found that the fire ant migrates to citrus trees when the land is cleaned up in the late fall, the ground harrowed, and none of the ant's usual food available, and they frequently do considerable damage, sometimes girdling young trees. They live in shallow nests at the base of the trees, frequently carrying the soil up on the side of the trunks. They work under this thin layer, cutting the bark of the trees and feeding upon the sap or gum. Sometimes a nest is made in the tree at the point where branching begins. Calcium cyanide B dust, applied with a bellows and dusted to the nest while the ants were disturbed, gave 100 per cent control. The creosote band was also safe and effective.

A brief statement of the status of the work with bees at the State Apicultural Research Laboratory, in charge of H. B. Parks, follows, and inspection work with foulbrood previously noted (E. S. R., 55, p. 159) is briefly referred to.

Methods for the experimental study of the relations of insects to weather, V. E. Shelford (*Jour. Econ. Ent., 19 (1926), No. 2, pp. 251–261, figs. 3*).—The author points out that the old idea that temperature can be summed so as to give approximately the time of development of a particular organism should be abandoned wherever accurate results are desired, and that the degree-hour developmental units should be substituted for effective degrees.

An analysis of some of California's major entomological problems, W. B. Herms (*Jour. Econ. Ent., 19 (1926), No. 2, pp. 262–270*).—A contribution from the California Experiment Station dealing with some of the more important entomological problems in that State.

The present status of biological control work in California, H. S. Smith (*Jour. Econ. Ent., 19 (1926), No. 2, pp. 294–302*).—This is a discussion of the subject with regard to the attitude of the public toward it and from the economic standpoint, contributed by the California Citrus Experiment Station.

The parasite element of natural control of injurious insects and its control by man, L. O. Howard (*Jour. Econ. Ent., 19 (1926), No. 2, pp. 271–282*).—This paper summarizes the work in introducing parasites, points out some of the mistakes that have been made, and generalizes as to the principles involved in work of this kind.

The effects of parasitism on the host and on the parasite, W. B. Herms (*Jour. Econ. Ent., 19 (1926), No. 2, pp. 316–325*).—This is a general discussion of the subject.

The relation of abundance of parasites to weather conditions, V. E. Shelford (*Jour. Econ. Ent., 19 (1926), No. 2, pp. 283–289, figs. 2*).—The author points out that parasites are governed by the same laws as other insects, abundance being influenced by weather, although no definite general rules can be laid down as to the relative effect upon the host and the parasite.

Some notes on the technic of handling parasites, D. W. Jones (*Jour. Econ. Ent., 19 (1926), No. 2, pp. 311–316*).—This is a contribution from the European corn borer laboratory of the U. S. D. A. Bureau of Entomology.

The legal side of regulatory work, G. G. Becker (*Jour. Econ. Ent., 19 (1926), No. 2, pp. 334–350*).—A general discussion.

The legal aspect of plant quarantines, L. A. Strong (*Jour. Econ. Ent., 19 (1926), No. 2, pp. 326–334*).—A general discussion of the subject.

Practice of estimating losses caused by insect pests to the small grains in Russia, D. N. Borodin (*Jour. Econ. Ent., 19 (1926), No. 2, pp. 227–235*).—The author presents a discussion of the methods employed, and points out that a knowledge of the cost of feeding a certain insect, if estimated correctly, is of particular value.

The effect on narcissus bulb pests of immersion in hot water, C. F. Doucette (*Jour. Econ. Ent., 19 (1926), No. 2, pp. 248–251*).—Tests made by the author gave satisfactory evidence that the immersion of narcissus bulbs in water kept at a temperature of 110 to 111° F. for three hours is fatal to bulb flies and bulb mites, and indicated that a much shorter time is required to give a complete mortality of the larvae of the two bulb flies and also of the bulb mites.

Desirability of fumigating dormant nursery stock, E. N. Cory (*Jour. Econ. Ent., 19 (1926), No. 2, pp. 378–383*).—A brief discussion.

Insects and parasites affecting livestock (*Texas Sta. Rpt. 1925, p. 18*).—In work conducted in cooperation with the U. S. D. A. Bureau of Entomology, it was found that sheep scab infestations develop very slowly during the hot and dry summer periods, and that a sheep may carry the sheep scab mite through an apparently dormant stage extending over a number of weeks.

The efficiency of sawdust bait in the control of grasshoppers, A. A. Granovsky (*Jour. Econ. Ent., 19 (1926), No. 2, pp. 211–218*).—This is a brief summary of the practical application of the sawdust sodium arsenite bait in the control of grasshoppers. In campaigns carried on in 1924 and 1925 this bait gave excellent control of the pest under different ecological conditions in two widely separated sections of Wisconsin infested with different species of grasshoppers, namely, the clear-winged locust (*Camnula pellucida* (Scud.)), ***Melanoplus atlanis*** (Ril.), ***M. luridus*** (Dodge), the red-legged grasshopper, the two-striped grasshopper, the Carolina grasshopper, and ***Chortophaga viridifasciata*** DeG. It was found that the use of molasses is not essential, a large area poisoned with the sawdust bait without molasses having given equally good results. The chemical analysis of poisoned grasshoppers indicates the need of a relatively small amount of arsenic for effective poisoning of the pest.

The common black field cricket, Gryllus assimilis (Fab.) and its control, H. C. Severin (*Jour. Econ. Ent., 19 (1926), No. 2, pp. 218–227*).—In this paper, the result of 12 years of study, the economic importance of the field cricket is discussed, followed by an account of the distribution of the pest over South Dakota. Data are also presented on the systematic status of the insect, its life history, the relative importance of the parasitic and predacious enemies, and control measures.

The present status of the control of the gipsy moth and the brown-tail moth by means of parasites, A. F. Burgess (*Jour. Econ. Ent., 19 (1926), No. 2, pp. 289–293*).—This is a discussion of the results of the introduction of the parasites of the gypsy moth and brown-tail moth during the past 20 years, which indicate that the work has been enormously beneficial.

The efficacy of lead arsenate in controlling the codling moth, R. H. Smith (*Hilgardia [California Sta.], 1 (1926), No. 17, pp. 403–453, figs. 19*).—This is a detailed report of investigations conducted in Idaho and California, but chiefly at the California Station in 1924. It presents a brief historical review of codling moth spraying, an account of studies with freshly hatched larvae, of larvae on apples sprayed with lead arsenate, on apples dusted with lead

arsenate, on apple leaves sprayed with lead arsenate, and on sections of glass sprayed and dusted with lead arsenate, calyx spray studies, and the behavior of freshly hatched larvae. Much of the data have been noted from another source (E. S. R., 55, p. 255). A list is given of 61 references to the literature cited.

Cutworm control in Oregon, B. G. THOMPSON (*Oregon Sta. Circ. 70 (1926), pp. 3–6, figs. 4*).—A brief account is given of cutworms, with directions for their control by the use of poison bran mashes. Of some 50 species which occur in Oregon, the variegated cutworm, the olive green cutworm (*Neuria procincta* (Grt.)), and the black cutworm are said to be the most important.

The potato tuber worm, H. SPENCER and W. O. STRONG (*Virginia Truck Sta. Bul. 53 (1925), pp. 419–463, figs. 4*).—This is a preliminary report upon the potato tuber worm, its history in Virginia; habits; host plants; relation to splitworm; morphological comparisons; comparative life history experiments, life history studies, and life history under storage conditions, the details of which are presented in tabular form; seasonal history; hibernation; winter storage of infested potatoes; fumigation of infested potatoes (largely in tabular form); field spraying and dusting; field cultural practices; marketing; and parasites.

This pest appeared in outbreak form in eastern Virginia during the fall of 1923, affecting parts of three counties. In 1924 and 1925 the southern and western limits of the infested district remained the same, but the pest spread northward about 15 miles in 1924 and still further in 1925. The known host plants in this district are potatoes, tobacco, Jimson weed (*Datura stramonium*), eggplants, tomatoes, horse nettle (*Solanum carolinense*), and peppers, apparently only solanaceous plants being attacked. It was found by cross breeding, crossing of host plants, comparison of genitalia of adults, and by comparison of life history stages when grown on the same food and under the same controlled temperatures that tuber worms of potatoes and splitworms of tobacco are identical. On the average about 25 days are required for a generation of the potato tuber worm in summer, 45 to 50 days in early spring or fall, and several months in winter.

The seasonal history varied in 1924 and 1925. The broods overlap so much in the fall that separation was difficult, but from rearing experiments it is possible that there were three or four broods in 1924 and five to eight in 1925. The growing season in 1925 was exceptionally hot and dry, which seemed to favor the insects. There were no worms found in the 1924 spring crop, and in the 1925 early crop they became abundant at the time digging was half finished. Both 1924 and 1925 fall crops were thoroughly and seriously infested.

It was found that winter conditions in the infested district do not kill all of the insects, particularly if there is some protection, as where piles of infested culls are dumped in the woods. Another danger lies in the large numbers of worms carried through the winters in barrels of stored home-grown fall seed potatoes. Many thousand barrels of fall potatoes were fumigated during the winters of 1923–24 and 1924–25 with carbon disulfide or hydrocyanic acid gas. Both fumigants failed to be as effective as desired, probably because of unsuitable storage and low temperatures. Preliminary tests of arsenical dusts and sprays and nicotine preparations gave negative results in the field. Recommendations are made as to practices to be followed as aids in the control of the pest.

Status of the potato tuber moth in Maryland, E. N. CORY and P. D. SANDERS (*Jour. Econ. Ent., 19 (1926), No. 2, pp. 235–239*).—This is a brief discussion of the status of the potato tuber worm on the Eastern Shore of Maryland.

Life history and habits of the Thurberia bollworm, Thurberiphaga diffusa Barnes (Noctuid), C. T. VORHIES (*Arizona Sta. Tech. Bul. 7 (1926), pp. 141–163, figs. 5*).—Following a brief introduction and historical sketch, the author gives descriptions of the several stages of *T. diffusa*, discusses its natural enemies, the distribution of the plant and bollworm, correlation in activity of the plant and bollworm, relative attractiveness of cotton and Thurberia, and the hatching and larval habits.

This bollworm commonly infests *Thurberia thespesioides*, the so-called wild cotton, in the mountains of southern Arizona, being destructive to the buds and bolls of the plant. The author has worked out the entire life history and finds it to be closely restricted to Thurberia as a food plant. It appears that it is not a potential pest of cotton and that its continued presence in Thurberia need not give cotton growers concern, since the moths would not oviposit on cotton and 390 eggs transferred to cotton gave no infestation, although eggs transferred to Thurberia resulted in normal infestations. Larvae in advanced instars will finish their feeding on cotton as a food plant, but there is no means by which such transfers are likely to occur in nature. The insect is active only about two months of the year, early August to early October, and remains approximately 10 months in pupal cocoons in the soil.

A list is given of 15 references to the literature.

The Mexican bean beetle in South Carolina, C. O. EDDY (*Jour. Econ. Ent., 19 (1926), No. 2, pp. 239–248, figs. 3*).—This is a contribution from the South Carolina Experiment Station on biological studies conducted in the State. A popular account of this pest in North Carolina, by Crawford (E. S. R., 53, p. 557), has been noted.

The mint flea-beetle (Longitarsus menthaphagus Gtnr.), L. G. GENTNER (*Michigan Sta. Spec. Bul. 155 (1926), pp. 13, figs. 4*).—This is a more extended account of *L. menthaphagus* than that previously noted (E. S. R., 52, p. 758). The name has been changed from *L. menthae* because this has been used for a European species.

A survey of the corn borer situation in 1925, L. H. WORTHLEY (*Jour. Econ. Ent., 19 (1926), No. 2, pp. 400–407, fig. 1*).—This is an account of the present status of the investigation of the European corn borer, with special reference to dispersion, quarantine and inspection, scouting, and control measures.

Status of the alfalfa weevil in Colorado, J. H. NEWTON (*Jour. Econ. Ent., 19 (1926), No. 2, pp. 371–376*).—The author points out that this pest has been present in Colorado for eight years, during which time it has spread at the rate of 6 miles per year, but no long jumps have taken place.

The introduction and establishment of the alfalfa weevil parasite, Bathyplectes curculionis (Thoms.), in the United States, T. R. CHAMBERLIN (*Jour. Econ. Ent., 19 (1926), No. 2, pp. 302–310*).—This paper deals with the receipt and release of this alfalfa weevil parasite in Utah, its rapid diffusion, and the various methods used since its colonization there to determine the extent of parasitism attained by it.

ANIMAL PRODUCTION

[The feeding value of dried orange pulp and raisin pulp] (*California Sta. Rpt. 1925, pp. 37–39*).—A preliminary study of the value of dried orange pulp for dairy cows indicated that this product has a feeding value equal to or better than dried beet pulp. When fed alone it was not palatable but was readily eaten when mixed with bran.

In another experiment 8 yearling cattle were fed for 36 days on a ration consisting of alfalfa hay, raisin pulp, barley, and cottonseed meal. The gains made per unit of feed indicated that raisin pulp is probably inferior to barley.

Four lots of 45 lambs each were fed in an 84-day experiment to test the comparative value of cull raisins, raisin pulp, and raisin stem waste as substitutes for two-thirds of the barley in whole barley and barley hay and whole barley and alfalfa hay rations. The results indicated that cull raisins and raisin by-products are of economic value in lamb feeding as they were readily eaten, but it was necessary to moisten the raisen stem waste before feeding.

In three experiments raisin pulp and cull raisins were compared with other feeds for swine. The results indicated the value of these materials in proper combinations.

Report on inspection of commercial feeding stuffs, 1925, E. M. Bailey et al. (*Connecticut State Sta. Bul. 277 (1926), pp. 397–487+XV*).—This is the usual report of the guaranteed and found analyses of feeds officially inspected during 1925 and up to March 1, 1926 (E. S. R., 53, p. 666).

[Experiments with beef cattle at the Canadian experimental farms], M. J. Tinline, J. A. Clark, D. D. Digges, W. H. Gibson, S. Ballantyne, J. A. McClary, W. H. Fairfield, W. W. Baird, W. A. Munro, V. Matthews, and W. T. Hunter (*Canada Expt. Farms, Rpts. Supts. 1924, Brandon (Man.) Farm, pp. 5–7; Charlottetown (P. E. I.) Sta., pp. 9–12; Harrow (Ont.) Sta., pp. 21, 22; Indian Head (Sask.) Farm, pp. 7–9; Kapuskasing (Ont.) Sta., pp. 10, 11; Lennoxville (Que.) Sta., pp. 5–7; Lethbridge (Alta.) Sta., pp. 5–9; Nappan (N. S.) Farm, p. 16; Rosthern (Sask.) Sta., pp. 5–7; Scott (Sask.) Sta., pp. 4–6; Summerland (B. C.) Sta., pp. 7, 8*).—Brief results of the experimental work conducted at the Canadian experimental farms during 1924 with beef cattle are given in these reports. Silage feeding mainly with sunflower and corn silage was compared with root crops at the Lethbridge, Rosthern, Scott, and Summerland Stations. The steers fed at the first of these were marketed in Great Britain in order to determine the advisability of this practice. Age was also taken into consideration in the Scott experiments. Further tests of the rate and economy of gains made by steers of different ages were conducted at the Brandon Farm. Grain and hay feeding was investigated at the Indian Head and Nappan Farms and Summerland Station. The experiments at the Charlottetown, Harrow, and Lennoxville Stations included tests of various methods of handling and feeding steers and the advisability of dehorning. Sunflower silage and oat, pea, and vetch silage were compared for wintering beef cattle at the Kapuskasing Station.

Beef cattle investigations [at the Fort Hays Substation], 1925–26 (*Kansas Sta., Fort Hays Substa. [Pamphlet], 1926, pp. [3–8]*).—The results of two feeding experiments are reported.

In the first experiment various kafir and cane roughages fed singly to different lots of 3-year-old steers were compared when supplemented with 2 lbs. of cottonseed cake per head daily in a 90-day test. The lots made average daily gains per head on the different kafir products as follows: Fodder with heads on 1.19 lbs., silage with heads on 1.82 lbs., stover with heads off 0.78 lb., silage with heads off 1.13 lbs., and kafir hay 1.26 lbs., and on the corresponding cane products 1.41, 2.08, 1.34, 1.56 lbs., and 1.00 lb., respectively. From the ins, feed consumed, and yields per acre it was estimated that 1 lb. of kafir ane fodder including the heads was worth from one-third to one-half more lb. of kafir or cane silage with the heads included. One lb. of kafir or

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cane stover was considered equivalent to from one-third to one-half more than 1 lb. of kafir or cane silage without the heads. Thus 1 acre of kafir or cane silage with or without the heads was equivalent to more than twice as much as 1 acre of cane or kafir fodder or stover containing a corresponding amount of grain. Cane appeared to be worth more than kafir in all forms of roughage except when fed as hay.

In another experiment 2 lots of steer calves and 2 lots of heifer calves were used for comparing cottonseed cake with cold pressed cottonseed cake as supplements to cane silage for wintering cattle in a 130-day test. The cottonseed products were fed at the rate of 1.5 lbs. per head daily with 31 lbs. of cane silage. The heifers and steers receiving the cottonseed cake made average daily gains per head of 0.86 and 0.99 lb., respectively, as compared with 0.74 and 0.71 lb., respectively, for the cold pressed cottonseed cake. From these results it was concluded that 100 lbs. of cottonseed cake containing 43 per cent of protein is equivalent to approximately 130 lbs. of cold pressed cottonseed cake containing 32 per cent of protein. The difference in feeding value is attributed largely to the presence of cottonseed hulls in the latter feed.

[Steer feeding experiments at the Crookston Substation], C. G. Selvig (*Minnesota Sta., Crookston Substa. Rpt. 1924, pp. 64–69, figs. 1*).—The results of the following experiments with steers are briefly reported:

Sweet clover for beef cattle.—In continuing the study of the value of sweet clover in a wintering ration for growing yearling steers (E. S. R., 53, p. 169), 4 lots of 7 individuals each were fed from November 1, 1923, to May 14, 1924 (196 days), on the following rations: Lot 1, alfalfa hay, corn silage, and oat straw; Lot 2, sweet clover hay, corn silage, and oat straw; lot 3, sweet clover hay and oat straw; and lot 4, wild hay and oat straw.

The results of the experiment, which are tabulated in detail, show that the steers in the different lots made average daily gains of 1.59, 1.44, 0.89, and 0.64 lb., respectively. It is pointed out that the lot receiving sweet clover hay and oat straw did not do as well as in the previous experiment, which is attributed to the fact that first cutting sweet clover hay was used in the present case as compared with second cutting sweet clover in the preceding year. The slight superiority of lot 1 is considered to indicate that first cutting alfalfa hay is better in quality than first cutting sweet clover hay. It was concluded that the most economical gains were made by lot 2 in this experiment. Silage helped to reduce the cost of gain and also aided in keeping the animals in a thrifty condition. Wild hay did not prove to be a satisfactory or economical feed when fed as in lot 4.

Pasture trials for beef cattle.—In testing the comparative value of yellow blossom sweet clover, white blossom sweet clover, and brome grass pastures, lots of steers were placed on such pastures for a 112-day period, beginning June 10, 1924, at the rate of one animal per acre.

The yellow blossom sweet clover and brome grass pastures contained 6 acres each, and the white blossom sweet clover 12 acres. Hay was cut as follows: From the yellow blossom sweet clover and white blossom sweet clover pastures, respectively, 4.6 tons and 7.69 tons. In order to prevent loss of weight a total of 8,400 lbs. of fodder was supplied to the steers on brome grass pasture, beginning September 9; 5,375 lbs. to those on white blossom sweet clover; and 2,665 lbs. to those on yellow blossom sweet clover, with the feeding beginning in the two latter groups on September 22. The average daily gain per steer during the pasture period on yellow blossom sweet clover was 1.27 lbs., white blossom sweet clover 1.36 lbs., and brome grass 1.02 lbs.

The results indicated that white blossom sweet clover has a slight advantage over yellow blossom sweet clover, and that the two types of sweet clover are both slightly superior to brome grass.

Soft corn for fattening cattle, J. W. Wilson and A. L. Bushey (*South Dakota Sta. Bul. 219 (1926), pp. 18, figs. 9*).—The results of a 118-day test of the comparative value of mature and immature corn when fed with alfalfa hay to 2-year-old steers are reported. There were 5 head in each lot, averaging approximately 857 lbs. per head. The average daily rations per head during the experiment were for lot 1 37 lbs. of snapped corn and 3.7 lbs. of alfalfa hay, lot 2 32 lbs. of husked corn from the same field and 3.9 lbs. of alfalfa hay, lot 3 32 lbs. of selected sweet corn from another field and 5.4 lbs. of alfalfa hay, and lot 4 31 lbs. of selected hard corn from the same field and 5.0 lbs. of alfalfa hay.

The average daily gains per steer and pounds of pork produced by hogs following the steers in each lot per bushel of corn consumed were for lot 1 3.06 lbs. of gain and 3.24 lbs. of pork; lot 2 2.84 lbs. of gain and 2.58 lbs. of pork; lot 3 3.06 lbs. of gain and 2.43 lbs. of pork, and lot 4 3.12 lbs. of gain and 2.76 lbs. of pork. From the records of lots 3 and 4 it was concluded that 0.52 lbs. more of soft corn than hard corn were required to produce 1 lb. of gain. The shrinkage of the steers during shipment to market averaged from 49 to 65 lbs. per head in the different lots, the largest occurring in the lot receiving snapped corn and the smallest when the field run of husked corn was given.

Analyses of the different types of corn used in the feeding tests showed that the selected soft corn as fed in lot 3 had a higher content of moisture, ash, and protein, with a decrease in the ether extract, starch, and sugar, and a lower shelling percentage than the selected hard corn from the same source. The composition of the types of corn fed to lots 1 and 2 were similar except that the moisture content of the grain of the husked corn was higher.

Ears were sorted from the different lots of corn as fed on the basis of an arbitrary standard for maturity, and it was found that corn of different grades was fed to all lots. Analyses of such samples showed that the immature types appeared to be better nitrogenous feeds than the mature corn. These analyses further indicated that sugar and protein are translocated from the husks to the corn as the corn matures. For this reason the husks of immature corn appear to be quite a valuable feed.

[Experiments with sheep at the Canadian experimental farms], W. H. Hicks, C. F. Bailey, W. H. Gibson, S. Ballantyne, P. Fortier, W. H. Fairfield, W. R. Leslie, V. Matthews, and J. A. Ste. Marie (*Canada Expt. Farms, Rpts. Supts. 1924, Agassiz (B. C.) Farm, pp. 14–17; Fredericton (N. B.) Sta., pp. 13, 14; Indian Head (Sask.) Farm, p. 10; Kapuskasing (Ont.) Sta., pp. 11, 12; La Ferme (Que.) Sta., pp. 13–16; Lethbridge (Alta.) Sta., pp. 10–15; Morden (Man.) Sta., pp. 10, 11; Scott (Sask.) Sta., pp. 7–9, fig. 1; Ste. Anne de la Pocatière (Que.) Sta., pp. 13, 14*).—The experiments conducted during 1924 with sheep at these stations included tests of the comparative values of different silages and roots for ewes at Agassiz, Indian Head, Kapuskasing, Lethbridge, Morden, and Scott. The problem of age and season for breeding, as well as the value of grading up, was tested at Agassiz, Indian Head, La Ferme, Scott, and Ste. Anne de la Pocatière. Various methods of feeding and breeding lambs were compared at the Fredericton and La Ferme Stations.

[Experiments with sheep at the Texas Station] (*Texas Sta. Rpt. 1925, pp. 17, 18, 19*).—The results of two experiments with sheep are briefly reported.

[*Grain sorghums v. corn for fattening lambs.*]—As a result of 5 comparative tests of the value of threshed milo, kafir, feterita, and ground shelled corn for fattening lambs (E. S. R., 50, p. 66), it has been concluded that the grain

sorghums have practically the same feeding value as corn. In 2 of the experiments the kafir produced the greatest gain, and each of the other feeds used produced the greatest gain in the other tests.

Shearing sheep twice a year and once a year.—In comparative tests of shearing once a year and twice a year it has been found in 5 years' trials that the 12-months fleece of aged ewes averaged 8.95 lbs. as compared with 9.37 lbs. for the combined fall and spring shearings of similar animals. In yearling ewes those sheared twice a year produced an average of 0.57 lb. more fleece than those sheared only once, while the wethers sheared twice a year produced 1.92 lbs. more fleece per head than those sheared once a year. The average results for all groups indicated that shearing twice a year produced only 0.52 lb. more wool than shearing once a year. Related observations have indicated that ewes sheared once a year produce an average lamb crop as high as those sheared twice a year and show no heavier winter losses.

Hogging down corn, W. E. J. Edwards and G. A. Brown (*Michigan Sta. Quart. Bul., 8 (1926), No. 4, pp. 171–173*).—In comparing supplements to corn hogged down, 1-acre plats of corn were sown at the rate of 8 to 9 lbs. of seed per acre. Dwarf Essex rape was also sown in one plat immediately after the last cultivation of the corn. In another plat Manchu soy beans were planted immediately after the corn was sown. Seven pigs averaging 149 lbs. were pastured on each lot beginning October 4. Tankage was supplied to the lot pastured on the plat in which standing corn alone was planted and minerals were available to all lots.

The results showed that corn and soy beans carried the 7 pigs for 30 days, while those on corn and rape and corn and tankage were carried for 34 days. The average daily gains per pig were 1.6 lbs. with rape, 1.7 lbs. with soy beans, and 1.5 lbs. with tankage. Estimates of the feed costs showed that the pigs in all lots returned high values for the corn consumed.

[Feeding experiments with swine at the Crookston Substation], C. G. Selvig (*Minnesota Sta., Crookston Substa. Rpt. 1924, pp. 69–71, 72, figs. 2*).—The results of the following experiments are briefly reported:

Feeding value of flax screenings.—Two lots of 9 pigs each, farrowed in August and September, were started on the following rations in December, 1923: Lot 1, 60 per cent of ground barley, 30 per cent of ground oats, and 10 per cent of tankage; and lot 2, 60 per cent of ground flax screenings, 30 per cent of ground oats, and 10 per cent of tankage. When the pigs averaged 150 lbs. in live weight the rations were changed by replacing 10 per cent of the ground oats and 5 per cent of the tankage in each by an equivalent amount of ground barley or ground screenings. Bone meal and salt were furnished as mineral supplements. The combined results during the 112-day feeding period showed that the lot receiving ground barley made average daily gains of 1.37 lbs. and consumed per pound of gain 2.84 lbs of barley, 1.23 lbs. of oats, and 0.47 lb. of tankage. The lot receiving the ground screenings made average daily gains of 1.26 lbs. and consumed 3.31 lbs. of flax screenings, 1.43 lbs. of oats, and 0.45 lb. of tankage.

The results show that the flax screenings had sufficient feed value to furnish a portion of the ration of growing pigs, although those receiving barley made more rapid gains and were better finished. It was estimated that about one-fourth of the threshed screenings was pigeon grass and lamb's-quarters, but analysis showed that 2.84 per cent immature flaxseed were present. The chemical composition of the screenings and barley shows that the former was higher in ash, protein, fat, and crude fiber, while the latter contained a larger percentage of carbohydrates.

Barley and tankage v. cracked wheat and tankage.—In studying the feeding value of cracked wheat, produced by the usual process of cleaning wheat for milling, two lots of pigs, averaging approximately 150 lbs. in live weight, were self-fed during a 28-day period as follows: Lot 1, barley and tankage, and lot 2, cracked wheat and tankage. Both lots received a mineral mixture of salt and steamed bone meal. The pigs receiving barley made an average daily gain of 2.02 lbs., as compared with 1.93 lbs. by the lot receiving cracked wheat. The amounts of feed consumed in the two lots per pound of gain were, respectively, 4.29 lbs. of barley and 0.19 lb. of tankage, and 3.79 lbs. of cracked wheat and 0.08 lb. of tankage.

The results showed that the cracked wheat, with its lower percentage of fiber and higher percentage of protein, produced more rapid growth, while barley showed a greater tendency to fatten and finish the pigs.

[Experiments with swine at the Texas Station] (*Texas Sta. Rpt. 1925, pp. 41, 42*).—The results of two experiments are briefly reported.

Cottonseed meal for swine.—In continuing the studies of the possibility of safely feeding cottonseed meal to swine (E. S. R., 50, p. 70), sows were fed a ration of 6 parts of milo chops and 1 part of cottonseed meal during gestation and lactation. The pigs were raised on the same ration after weaning and allowed to run on Sudan grass pasture. They were later divided into uniform lots and hand-fed during a 60-day fattening period in dry lot. During this fattening test one lot received the same ration of cottonseed meal and milo, while the other lot received a ration of 9 parts of ground milo and 1 part of 60 per cent protein tankage. The lot receiving the cottonseed meal and milo ration made average daily gains of 1.08 lbs. during this period, as compared with 1.51 lbs. for the pigs on the milo and tankage ration. Both lots were healthy in every respect, though the former lot was not as well finished. Of the sows selected from these pigs 3 farrowed litters of pigs averaging 2.91 lbs. in live weight, all of which were normal and grew rapidly even though their mothers were still on the cottonseed meal ration. In the second generation the pigs were raised on the milo and cottonseed ration and fed in dry lot for 70 days on the same ration without evidence of detrimental effects from the cottonseed meal.

Effect of minerals in swine rations.—In a study of the effect of adding minerals to fattening rations of swine 3 lots of 20 pigs each, averaging approximately 100 lbs. in live weight, were fed in a 60-day test. The basal ration consisted of milo and tankage, 9 to 1, but one lot received an additional supplement of 1 per cent sodium chloride and another of 1 per cent of a mineral mixture consisting of equal parts of hardwood ashes, salt, and air-slaked lime. The results of this trial showed practically no difference in the rate of gain in the 3 lots, and the addition of minerals did not decrease the amount of feed required per unit of gain.

[Experiments with swine at the Canadian experimental farms], W. H. Hicks, M. J. Tinline, C. F. Bailey, W. H. Gibson, S. Ballantyne, F. H. Reed, P. Fortier, J. A. McClary, W. W. Baird, W. A. Munro, V. Matthews, and J. A. Ste. Marie (*Canada Expt. Farms, Rpts. Supts. 1924, Agassiz (B. C.) Farm, pp. 17–19; Brandon (Man.) Farm, p. 8; Fredericton (N. B.) Sta., pp. 16–19; Indian Head (Sask.) Farm, pp. 11–13; Kapuskasing (Ont.) Sta., pp. 12–15; Lacombe (Alta.) Sta., pp. 14–27; La Ferme (Que.) Sta., p. 12; Lennoxville (Que.) Sta., pp. 13–16; Nappan (N. S.) Farm, pp. 18–21; Rosthern (Sask.) Sta., pp. 12–18; Scott (Sask.) Sta., pp. 10–15, fig 1; Ste. Anne de la Pocatière (Que.) Sta., pp. 11–13*).—The experiments conducted during 1924 have dealt mainly with various types and methods of feeding hogs during the finishing periods. Self-feeding, hand feeding, heavy feeding, and light feeding for dif-

ferent periods have been compared at the Fredericton, Kapuskasing, Lacombe, Lennoxville, Rosthern, and Scott Stations and Agassiz and Nappan Farms. The results of feeding in dry lot and on various forage crops were also given from the Kapuskasing, Lacombe, and Scott Stations and Brandon, Indian Head, and Nappan Farms, and the use of mangels and potatoes for swine was tested at the Agassiz Farm. In the tests at the Fredericton, Lacombe, La Ferme, Lennoxville, Scott, and Ste. Anne de la Pocatière Stations and Agassiz and Indian Head Farms, various grains, including mostly barley, corn, or oats, have been fed with or without tankage or other protein supplements to different lots and the results compared. Other tests include comparative results from summer and winter feeding from the Lacombe Station and Nappan Farm, and the relative efficiency of Berkshire and Yorkshire breeds for bacon production from the Scott Station and of Berkshire, Yorkshire, Duroc-Jersey, and crossbreds from the Lacombe Station.

The compartive palatability of different forage crops was investigated at the Lacombe Station. Yorkshire, Berkshire, Duroc-Jersey, and crossbred sows were also compared as to the numbers and mortality of the pigs produced at the same station.

Soft pork studies.—I, Formation of fat in the pig on a ration moderately low in fat, N. R. ELLIS and O. G. HANKINS (*Jour. Biol. Chem., 66 (1925), No. 1, pp. 101–122, figs. 6*).—This paper gives an account of the amount and quality of fat produced in pigs from 6 weeks to 8 months of age on rations of corn meal and skim milk 1:3 and corn meal and tankage 100:15 in experiments conducted at the U. S. D. A. Experiment Farm, Beltsville, Md. Four litters consisting of 34 pigs were hand fed individually on the former ration from the age of 12 to 20 weeks, after which 2 litters were lot fed and 2 were individually fed. Representative pigs from each litter were killed at 6 and 10 to 12 weeks and at 5, 6, 7, and 8 months of age. In the second experiment, 2 litters were self-fed with the corn meal and tankage ration in lots, and the pigs of another litter were self-fed individually on a ration of corn 100 parts, tankage 14.5 parts, and alfalfa meal 6 parts.

The pigs were taken directly from the feed lots for slaughtering at 6 and from 10 to 12 weeks, but prior to slaughtering at the later ages they were restricted to water for 24 hours. Records were obtained on the slaughtered animals showing the live and dressed weights and the weights of individual and total organs and blood. Analyses for water, protein, fat, and ash were made of all parts of the animals except the hair and intestinal contents. The data for each animal are tabulated, and the averages for the animals in each of the experiments slaughtered at the six different ages are given. The most significant differences in the analyses of the entire carcasses were the increases in the percentages of fat from 18.25 for the pigs of the youngest age to 41.78 per cent for the oldest pigs in the first experiment and from 17.96 to 40.74 per cent for the corresponding ages in the second experiment. The increase in fat percentage was mainly offset by a decreased percentage of water in the carcass.

Determinations of the refractive index, iodine number, and melting point were made of fat samples prepared from the meat fractions of each pig, as well as similar determinations for the back and leaf fat. The changes observed in the fat constants indicated that a decrease in the degree of unsaturation of the fat was accompanied by a change in the carcass grades from soft to hard. The continued feeding on the experimental rations produced a progressively harder fat. The degree of hardness was a little more pronounced on corn and skim milk than on the corn and tankage ration.

Composite samples of the fat of all animals killed at similar ages were used for determinations of the fat constants and for the separation of the fatty acids by the lead salt-ether method. The fluctuations in the fat composition during the fattening period are discussed. The increased proportion of fat deposition during fattening produced from the carbohydrate and protein portion of the ration is pointed out. Thus with the growth of the animals it was necessary to synthesize more and more of the fat. The synthesized fats were the harder ones, and resulted in a decreased iodine number and refractive index and an increased melting point for the fat of the older pigs. The fat analysis showed an increase in the percentage of saturated acids and a decrease in linoleic acid, with the percentage of oleic acid remaining rather constant.

[Horse breeding experiments at the Cap Rouge Experimental Station], G. A. LANGELIER (*Canada Expt. Farms, Cap Rouge (Que.) Sta. Rpt. Supt. 1924, pp. 8–10*).—The various experiments relating to horse production conducted at this experimental station during 1924 and briefly reported include studies of inbreeding, line breeding, and out breeding; methods of wintering idle work horses; and the cost of raising colts when wintered in cheap sheds.

[Experiments with poultry at the Canadian experimental farms], M. J. TINLINE, G. A. LANGELIER, J. A. CLARK, C. F. BAILEY, S. BALLANTYNE, P. FORTIER, F. H. REED, J. A. MCCLARY, W. R. LESLIE, W. W. BAIRD, V. MATTHEWS, W. H. FAIRFIELD, E. M. STRAIGHT, J. A. STE. MARIE, and W. T. HUNTER (*Canada Expt. Farms, Rpts. Supts. 1924, Brandon (Man.) Farm, pp. 84–87; Cap Rouge (Que.) Sta., pp. 40–44, fig. 1; Charlottetown (P. E. I.) Sta., pp. 57–65, fig. 1; Fredericton (N. B.) Sta., pp. 65–69; Kapuskasing (Ont.) Sta., pp. 53–57; Lacombe (Alta.) Sta., pp. 54–60; La Ferme (Que.) Sta., pp. 41–44; Lennoxville (Que.) Sta., pp. 49–52; Lethbridge (Alta.) Sta., pp. 38–41; Morden (Man.) Sta., pp. 52–54; Nappan (N. S.) Farm, pp. 61–64; Scott (Sask.) Sta., pp. 42–44; Sidney (B. C.) Sta., pp. 40–46; Ste. Anne de la Pocatière (Que.) Sta., pp. 35–39; Summerland (B. C.) Sta., pp. 61–71*).—Experiments conducted at the Canadian experimental farms during the year 1924 dealt with various phases of poultry production. In feeding tests for egg production, various protein supplements, including skim milk, meat scrap, fish meal, etc., were tested at the Cap Rouge, Fredericton, Kapuskasing, Lacombe, Morden, and Sidney Stations and Nappan Farm. Studies of the value of green feed for egg production were made at the Cap Rouge, Fredericton, Kapuskasing, La Ferme, and Summerland Stations and Brandon Farm. Such green feeds as roots, clover leaves, and sprouted oats were used in these experiments. The value of various grains for egg production was tested at the different stations, those especially compared being hull-less and common oats at the Scott, corn v. no corn at the Kapuskasing and Scott, and corn v. barley at the Lacombe and La Ferme Stations. Screenings were also fed to a lot of birds at the Cap Rouge Station. Various home mixed and commercial grain mixtures were used in feeding trials at Cap Rouge, Charlottetown, Fredericton, Nappan, Sidney, and Summerland. The numbers of eggs produced by birds receiving water as compared with snow for drinking purposes were determined in investigations at the Cap Rouge and Kapuskasing Stations. Monthly determinations of the feed costs of egg production were also reported from the Ste. Anne de la Pocatière Station.

In feeding experiments with young chicks, whole milk and skim milk were used in trials at the Kapuskasing Station, and the general methods of chick feeding were studied at the Lacombe, Lennoxville, Morden, and Ste. Anne de la Pocatière Stations. Various studies of breeding poultry were undertaken at several of the different stations, which included line breeding v. out breeding and inheritance of egg color at Lethbridge, inheritance of egg size at Sum-

merland, and general studies of the inheritance of egg production at the Charlottetown, Lennoxville, and Sidney Experimental Stations. The effects of different methods of management were also investigated at certain of the stations, housing studies were undertaken at Cap Rouge, confinement and range were studied at Sidney and Summerland, and lights were compared with no lights at the Kapuskasing and Morden Stations. The advantages of early, medium, and late hatched pullets as egg producers were tested at Nappan and Sidney. The fattening of poultry either in pens or crates was undertaken at Kapuskasing, La Ferme, Sidney, Ste. Anne de la Pocatière, and Cap Rouge. The storage of eggs was investigated at Charlottetown.

Studies of incubation dealing with the relative fertility, hatchability, and livability of the chicks haching from hen's and pullet's eggs were reported from Cap Rouge, Fredericton, Lacombe, La Ferme, Lennoxville, Lethbridge, Morden, and Sidney. The effect of the egg production on hatching was further reported on from the Cap Rouge Station. Different types of incubators were compared at Lacombe, La Ferme, and Sidney, and the effects of temperature and humidity on incubation were noted from the Lethbridge Station. Eggs were set at different dates for comparison at Brandon, Charlottetown, Lacombe, La Ferme, and Sidney. Some investigations with turkeys dealing especially with confinement were undertaken at the Lethbridge Station.

[**Poultry experiments at the Crookston Substation**], C. G. SELVIG (*Minnesota Sta., Crookston Substa. Rpt. 1924, pp. 72-75*).—The results of experiments in incubating, brooding, feeding, and breeding of poultry are briefly reported.

A comparison of the hatching results showed that of the eggs set during March 57 per cent hatched as compared with 60 per cent for those set during April, 61 per cent for those set during May, and 51 per cent for those set during June. The hatching results with six different breeds showed that the Rhode Island Whites hatched 51 per cent, Rhode Island Reds 54 per cent, Barred Plymouth Rocks 65 per cent, Black Minorcas 48 per cent, Buff Leghorns 76 per cent, and White Leghorns 61 per cent. Based on the entire data, 67 per cent of the eggs set under hens hatched, while 56 per cent of those set under pullets produced chicks.

In a test comparing various drinks for chicks in lots of 100, the mortality was 17 per cent in the lot receiving water, 13 per cent with sweet skim milk, 10 per cent with sour skim milk, and 8 per cent with buttermilk. The average weights of the chicks at 3 weeks and the gains stood in inverse relation to the mortality, thus buttermilk proved to be the best from the standpoint of mortality, chick weight, and gains.

In a study of the value of green feeds for egg production, one lot of 50 White Leghorn pullets was given cabbage or mangels in winter and grass or clover in the summer, while another lot received no green feed but was allowed range in a bare yard. The former lot produced an average of 117 eggs per bird as compared with 86.5 eggs for the latter lot.

Comparing purebred and mongrel hens, it was found that 52 per cent of the eggs from mongrel hens hatched, with a chick mortality of 16 per cent, while 75 per cent of the eggs from White Leghorns hatched, with a chick mortality of only 2.1 per cent. During the first year the 40 mongrels laid an average of 55 eggs per bird as compared with 119 eggs by the purebred White Leghorns.

In a fattening experiment Barred Plymouth Rock capons were compared with cockerels. During three weeks' feeding the capons made an average gain of 1 lb., requiring 5.48 lbs. of feed, while the cockerels made an average gain of 0.494 lb., requiring 10.41 lbs. of feed. A marked advantage is thus shown for the capons.

[Experiments with poultry at the Texas Station] (*Texas Sta. Rpt. 1925, p. 40*).—The results of the following experiments are briefly reported.

Comparison of various feeds for young chickens.—In studying the fundamental factors responsible for the beneficial effects of buttermilk in the control of coccidiosis in chicks, 10 lots were selected and fed on a ration of yellow corn meal, bone meal, oyster shell, and salt. The addition of 1 per cent of lactic acid to the drinking water appeared to be of no value in reducing losses, as the losses were greater in all cases where lactic acid was used and the chicks did not grow as rapidly as those not receiving lactic acid. The lot receiving the most skim milk and one-third buttermilk made the most rapid gains and had a low mortality.

Variation in hatching quality of eggs.—Marked variations have been observed in the hatching percentages of eggs set under 65 individual hens, the range being from 0 to 100 per cent. Of 50,024 eggs artificially incubated from 32 different flocks the hatchability ranged from 22.2 to 74 per cent. Seasonal conditions, flock management, and treatment of the eggs appeared to have a marked influence on the hatchability.

The relative values of green oat-sprouts, green alfalfa, and cod liver oil in the prevention of rickets in growing chicks, J. S. Hughes, R. W. Titus, and L. Witham (*Poultry Sci., 5 (1925–26), No. 2, pp. 59–66, figs. 4*).—Nine lots of 25 day-old chicks each were selected at the Kansas Experiment Station for this test. All received a basal ration of 90 per cent grain and 10 per cent tankage. The lots of one group were placed in direct sunlight daily, while two groups were kept continuously in the laboratory, one receiving 5 minutes' exposure to ultra-violet light daily. One lot of each of these groups received a supplement of 10 per cent of green alfalfa to the basal ration, another lot of each group received 0.5 per cent of cod-liver oil, and the other three lots received 10 per cent of fresh sprouted oats. The lots on the last two rations received 0.25 per cent alfalfa ash, which was equivalent to the ash of the green alfalfa given in the first ration. Five chicks from each lot were killed at the end of the experiment and the blood and bones analyzed.

The results of the test showed that cod-liver oil furnished a sufficient amount of antirachitic factor to allow normal development, but rickets developed in the rations containing alfalfa and sprouted oats. The oat sprouts appeared to contain as much of the antirachitic factor as the alfalfa. The ordinary superiority of alfalfa over sprouted oats in aiding mineral assimilation is attributed to the higher ash content of alfalfa. Either 5 minutes' exposure to ultra-violet light or daily exposure to the sunlight allowed normal growth. The bones of the chickens not receiving a sufficient amount of the antirachitic factor were lower in ether extractable material than bones of normal chickens.

Feeding for eggs, C. M. Ferguson (*Michigan Sta. Quart. Bul., 8 (1926), No. 4, pp. 178–181, fig. 1*).—By gradually increasing the amount of grain and adding buttermilk to the ration fed in a Michigan egg-laying contest egg production was increased, but leg weakness occurred among pullets. The addition of 6 per cent of cod-liver oil to the milk and more green feed has not only controlled leg weakness but has considerably increased the winter egg production. The quality of the eggshells has been improved and the percentage of blood spots decreased. Data on the feed costs and suggestions for summer management are also given.

The Maryland State egg-laying competition and performance tests, II, R. H. Waite and F. H. Leuschner (*Maryland Sta. Bul. 279 (1926), pp. 149–159, fig. 1*).—A popular account of the Maryland State egg-laying contest, including the rules for the 1926–27 competition (E. S. R., 53, p. 877

A brooder for indoor use in nutrition experiments with young chicks C. W. Carrick (*Poultry Sci., 5 (1925–26), No. 2, pp. 98–101, fig. 1*).—An indoor brooder particularly adapted for conducting nutrition experiments with chicks in the laboratory is described. This brooder has been found very satisfactory in such experiments at the Indiana Experiment Station.

The oogenesis of the fowl (Gallus bankiva), F. W. R. Brambell (*Roy. Soc. London, Phil. Trans. Ser. B, 214 (1925), No. B414, pp. 113–151, pls. 6, figs. 5*).—This is an account of cytological studies of oogenesis in the fowl, with special reference to the Golgi apparatus as observed from preparations of the ovaries of birds of the following ages: 4 days, 3, 6, and 11 weeks, and adults.

Capons in New Jersey, L. M. Black (*New Jersey Stas. Hints to Poultrymen, 14 (1926), No. 9, pp. 4, fig 1*).—Directions for caponizing fowls, including a discussion of the relative prices and the market demands for capons, and suggestions as to care of the birds before and after the operation and the necessary equipment.

DAIRY FARMING—DAIRYING

The amount of milk-producing feeds required by dairy cows [trans. title], N. Hansson (*Meddel. Centralanst. Försöksv. Jordbruksområdet [Sweden], No. 296 (1925), pp. 24, figs. 2*).—The results of experiments conducted in the Danish Research Laboratory with a respiration apparatus have largely substantiated the earlier specifications in feeding standards for dairy cows. The available results regarding the feed required for milk production indicate that the composition of the milk must be taken into consideration, and that the amount of feed required is in direct proportion to the amount of energy and the amount of protein contained in the milk produced. The estimate based on the results of these experiments indicates that 0.3 fodder unit is required per kilogram of milk when the fat content is 2.75 per cent. This is increased to 0.4 fodder unit when the fat content is 4.5 per cent. The milk under normal conditions contains not more than 75 per cent of the digestible protein in the feed. Some variability is expected in the amount, due to the biological value of the protein. Additional amounts of protein may have a stimulating effect on milk production up to 10 to 20 per cent, but further increases in the amount were more inclined to be detrimental. The requirements in fodder units, starch value, and digestible protein per kilogram of milk varying in fat content from 2.75 to 5 per cent are tabulated.

Soybean hay v. wheat bran and mixed hay in milk production, H. R. Bierman (*Maryland Sta. Bul. 277 (1925), pp. 89–95*).—In an investigation of the value of soy bean hay for milk production 2 groups of 4 cows each were fed during four 30-day periods, with 5-day transition periods, on a basal ration of ground corn and corn silage with the addition of soy bean hay in 2 of the periods and mixed hay and wheat bran in the other 2 periods.

The total production of all cows on the wheat bran and mixed hay ration was 8,740.5 lbs. of milk and 416.71 lbs. of butterfat, and on the soy bean hay ration 7,738.2 lbs. of milk and 367.57 lbs. of butterfat. Milk production was decreased with all cows when changed from the wheat bran ration to the soy bean ration and was increased with all, except one cow nearly dry, when the opposite change was made. The cows refused 17.37 per cent of the soy bean hay, which consisted mostly of coarse stems.

Estimates of the value of the feeds indicated that the feed cost per pound of milk and butterfat was less on the soy bean ration than on the wheat bran ration.

[Experiments with dairy cattle at the Canadian experimental farms], W. H. Hicks, G. A. Langelier, C. F. Bailey, S. Ballantyne, F. H. Reed, W. W. Baird, and J. A. Ste. Marie (*Canada Expt. Farms, Rpts. Supts. 1924, Agassiz (B. C.) Farm, pp. 10–12; Cap Rouge (Que.) Sta., pp. 6, 7; Fredericton (N. B.) Sta., pp. 8–10; Kapuskasing (Ont.) Sta., pp. 7–10; Lacombe (Alta.) Sta., p. 12; Nappan (N. S.) Farm, pp. 14–16; Ste. Anne de la Pocatière (Que.) Sta., pp. 6–8, 10, 11*).—Brief results of the experiments with dairy cattle conducted during the year 1924 at these experiment stations are given. Those at Agassiz, Fredericton, Kapukasing, Lacombe, Nappan, and Ste. Anne de la Pocatière included tests of silages and comparisons of various types of silages with root crops for milk production. Home-grown and commercial mixtures were compared for milk production at the Agassiz Farm, and the different amounts of grains were similarly tested at the Cap Rouge Station, as well as various methods of wintering dairy cattle at the latter institution. Three stations further compared various methods of feeding young stock. Whole milk, skim milk, calf meals, and powdered milk products were used for calves at the Cap Rouge and Ste. Anne de la Pocatière Stations, while heavy and light feedings for dairy heifers were compared at the Fredericton Station.

Feeding for production, R. Baker (*So. Aust. Dept. Agr. Bul. 189 (1925), pp. 16*).—Popular directions for feeding dairy cows for milk production.

Cattle production [trans. title] (*Min. Agr. [Belgium], Serv. Élevage Pub. 7 (1925), pp. 23, figs. 9*).—Popular directions for the management, breeding, feeding, and selection of dairy cattle.

The pigment of the self-colored gray brown mountain cattle [trans. title], R. Haugg (*Züchtungskunde, 1 (1926), No. 2, pp. 63–79, fig. 1*).—A study of the nature of pigmentation.

Judging of dairy cattle and some of its problems, J. W. Gowen (*Jour. Heredity, 17 (1926), No. 1, pp. 13–26, figs. 11*).—This is a discussion of the relation of the various characters used in judging dairy cattle to their actual production, based mainly on the findings with the various breeds at the Maine Experiment Station (E. S. R., 53, p. 781).

Depraved appetite in dairy cattle, C. F. Huffman and G. E. Taylor (*Michigan Sta. Quart. Bul., 8 (1926), No. 4, pp. 174–177, figs. 3*).—The common symptoms of depraved appetite in cattle are discussed. The cause of this condition on Michigan farms has been found to be due to a phosphorus deficiency. Its severity is therefore associated with the seasons when little or no grain is fed. Chemical analyses of pasture grasses showed that the phosphorus content is much higher during midsummer and early fall than in the early spring. Access to a mixture of 1 part of salt and 2 parts of steamed bone meal is suggested as a means of preventing this condition.

The inception of lactation in the cow and goat, S. A. Asdell (*Jour. Agr. Sci [England], 15 (1925), No. 3, pp. 358–374, fig. 1*).—This paper deals with a continuation of the study of mammary secretions conducted by Woodman and Hammond (E. S. R., 49, p. 781). The amounts and composition of the secretion of the mammary gland prior to service, during pregnancy, and after parturition were compared. Similar analyses were made of the secretions of several goats sampled at less frequent intervals.

The appearance at the middle of pregnancy of a viscous secretion, consisting mainly of globulin, was the most striking observation. Colostrum was concluded from these studies to be normal milk mixed with the globulin secretion. It appears that globulin is produced by the glands when they are undergoing the transition from growth to the secretory stage. The cause of the acceleration in the development of the mammary gland appears to be related to the development of the corpus luteum, but also at this time the relation between

the rate of increase in the embryonic fluids and fetuses is reversed. The presence of globulin in the mammery secretions may indicate the first pregnancy, but pathological conditions may also influence the production of globulin. Cases of premature lactation with analyses of the secretions are recorded and discussed. The influence of the corpus luteum appears most logical. An inhibitory effect of the developing fetus on mammary secretion seems unnecessary, since cells do not secrete during growth.

The mucous secretion of the cervix of the cow, H. E. WOODMAN and J. HAMMOND (*Jour. Agr. Sci. [England], 15 (1925), No. 2, pp. 107–124*).—This investigation deals with a chemical study of the secretions of the cervix of cows killed at a Cambridge abattoir, including descriptions of the character and amount of secretions during the different phases of the oestrous cycle and pregnancy. Further experiments were carried out to determine the effects on the consistency of the secretions of the chemicals commonly used in veterinary and human medicines as douches.

The studies showed that the mucus secretions of the vagina invariably had a higher moisture content than the cervix. The amount of mucus in the vagina and cervix was lowest just after heat, due to the liquefaction and draining away during the heat period. The amount of mucus in the cervix appeared to increase during pregnancy, but the color was white as compared with the normal yellow in the nonpregnant animal.

Chemical studies of the secretions showed that they were weakly alkaline in reaction to litmus, and that they were soluble in dilute alkaline solutions but were precipitated by acids. Reducing sugars were not present in aqueous solutions of the dried extract, but their presence was demonstrated after hydrolysis with dilute hydrochloric acid. Other tests also indicated the presence of a glucoprotein, which was considered to be mucin and shown to be of the class containing muscoitin sulfuric acids in the molecule. Further tests showed the presence of cholesterol and phosphates, together with the various elements in the ash.

One abnormal heifer showed a large accumulation of the secretion in the vagina caused by an adhesion or possibly an unruptured hymen.

The effect of various chemicals on the conditions of mucous secretions was determined in a number of tests.

The bacterial flora of normal cow's udder, L. COPELAND and T. M. OLSON (*South Dakota Sta. Bul. 218 (1926), pp. 20*).—The first part of this bulletin gives an account of bacterial and cell counts and the time required for reduction in the methylene blue test by samples of milk aseptically drawn from each of the four quarters of the undder of the 40 cows in the station herd. It was found that the bacterial counts ranged from 0 to 347,000 per cubic centimeter, while the cell counts ranged from 11,000 to 15,500,000 per cubic centimeter, with a correlation of 0.6370 ± 0.03364 between the bacterial counts and the cell counts. The relation between the bacterial counts and the reduction time was not so close. There were no differences in bacterial counts associated with age except that the numbers of both bacteria and cells were considerably higher in cows over 7 years of age. Bacterial counts made from each quarter of the udder of 4 cows at 5-day intervals for a 14-month period did not show regular monthly differences except that the count was greatly increased after parturition. Large increases in the bacterial and cell contents were found in the colostrum of 6 cows.

Typical colonies selected from the plates used in making the bacterial counts were also studied with reference to their morphology and fermentation qualities. Of those examined microscopically 98 per cent were Gram-positive micrococci. They fermented sugar without the formation of gas, and some

did while others did not liquefy gelatin. Only small amounts of total or volatile acids were produced. There was considerable variability in the action of the individual organisms on milk protein. Some curdled the milk by the production of an enzyme, and certain types digested the curd. Tests of the germicidal action of the milk of individual cows also showed considerable variability. Bacteria injected into the udder survived only a few days.

Better milk from cleaner cows for New Jersey, H. C. Moore (*New Jersey Stas. Circ. 189 (1926), pp. 8, figs. 5*).—The essential points to be observed in the production of clean milk are popularly presented.

How to conduct milk and cream contests, E. Kelly and R. J. Posson (*U. S. Dept. Agr., Dept. Circ. 384 (1926), pp. 24, figs. 5*).—This is a revision of and supersedes circular 53 (E. S. R., 42, p. 377). Suggestions are given for conducting voluntary and surprise milk and cream contests, including forms of application blanks, score cards, and directions for scoring milk and cream and determining specific gravity, butterfat, solids-not-fat, acidity, sediment, flavor and odor, and bacterial count. Guides for the scoring of flavor and odor, bottles and caps, and the apportioning of bacterial counts as determined from several samples are also given.

The action of rennet extract on the paracasein of skim milk as affected by different organic acids, C. T. Townsend (*Sci. Agr., 6 (1926), No. 5, pp. 158–164, fig. 1*).—A series of experiments have been conducted at Macdonald College in which 3 per cent of chloroform was first added to milk, then rennet in amounts of 1 to 1,000, and finally 10 per cent of N/5 or N/10 solutions of lactic, propionic, or acetic acids. Analyses were made for the paracasein content of the milk after seven days at room temperature. The results showed that the digestibility of paracasein was greater in the presence of the acids. Lactic and propionic acids had more effect in the lower concentrations, but the action of acetic and propionic acids was more pronounced than that of lactic acid in the higher concentrations.

[Experiments with dairy products at the California Station] (*California Sta. Rpt. 1925, p. 50*).—C. S. Mudge found in investigations of factors affecting the size of colonies in plating milk that the addition of 0.5 per cent of lactose to the medium and incubation at 30° C. would increase the size of the colonies, thus rendering the counting more accurate.

Investigations by A. W. Farrall of the power, steam, and water requirements of three types of standard milk can washing and sterilizing equipment showed that the average steam consumption varied from 3.64 to 5.59 lbs., the average water consumption from 1.08 to 4.06 gal., and the electric power consumption from 0.0236 to 0.00045 kw. per 10-gal. can.

Studies of the methods of testing goats' milk for butterfat by D. H. Nelson showed that the Babcock test averaged 0.05 per cent lower, and the Fucoma method 0.069 per cent lower, than the ether extraction (Mojonnier) method, which was used as the standard. Similar tests on cows' milk by C. A. Phillips showed the Babcock test to be 0.058 per cent higher than the fat extraction method. The lower tests on goats' milk are believed to be due to the larger percentage of small fat globules and the resulting difficulty in bringing them to the surface by centrifugal force.

VETERINARY MEDICINE

[Report of veterinary science work at the California Station] (*California Sta. Rpt. 1925, pp. 70–73*).—This includes notes on studies previously noted by Hart and Woods (E. S. R., 54, p. 576), by Hart and Traum (E. S. R., 53, p. 180), by Beach (E. S. R., 54, p. 277), and by Beach and Davis (E. S. R.,

54, p. 278). The results of work on the elimination of *B. abortum* in the feces of suckling calves fed infected milk, by E. H. Barger and F. M. Hayes, showed that *B. abortum* passed through the entire digestive tract and was eliminated with the feces of suckling calves fed milk either artificially or naturally infected.

B. sanguinarium was found to be an important cause of disease in chicks as well as in adult fowls. In one flock deaths from this cause began when the chicks were 60 hours old and resulted in a loss of more than half of the flock. The results indicate that hens may acquire chronic infection of the ovaries with *B. sanguinarium* and transmit the infection through the egg to the offspring. A new public service activity started during the year is that of making agglutination tests for the detection of fowls in breeding flocks that are carriers of *B. pullorum* infection.

Report of the New York State Veterinary College at Cornell University for the year 1923–1924 (*N. Y. State Vet. Col. Rpt. 1923–24, pp. 226, pls. 4, figs. 35*).—The following papers are included in this report: The Bacterial Content of Milk or Inflammatory Exudates from Cases of Mastitis in Cattle (pp. 52–58) and The Use of Living Suspensions of Alpha Hemolytic Streptococci in the Control of Bovine Mastitis (pp. 59–69), both by C. M. Carpenter; Report of Poultry Disease Investigation, by E. L. Brunett (pp. 70–73); Intussusception in Dogs (pp. 74–81) and Obstruction in the Oesophagus (pp. 82–86), both by H. J. Milks; Immunizing Young Pigs against Hog Cholera, II, by J. W. Benner (pp. 87–90) (E. S. R., 51, pp. 285, 582); The Blood and Urine of the Cow in Milk Fever (pp. 91–101) and A Study of the Extractives of the Blood of the Cow (pp. 102–110), both by C. E. Hayden and L. B. Sholl; The Reason for Failure to Obtain Growth of an Obligatory Anaerobe (*Actinomyces necrophorus*) on Plate Cultures Incubated in an Anaerobic Jar, by W. A. Hagan (pp. 111–114); The Formation of Peroxide by an Obligatory Anaerobe (*Actinomyces necrophorus*); the Tolerance of this Organism for Peroxide, by W. A. Hagan (pp. 115–122); Studies on Intradermal Tuberculin, by W. A. Hagan and J. Traum (pp. 123–157); and Fat Digestion, Absorption, and Assimilation in Man and Animals as Determined by the Dark-field Microscope, and a Fat-Soluble Dye, by S. H. Gage and P. A. Fish (pp. 158–216).

[Work in veterinary medicine at the Texas Station] (*Texas Sta. Rpt. 1925, pp. 6–10*).—The projects reported upon, which were in charge of H. Schmidt, include loin disease studies, earlier reports upon which have been noted (E. S. R., 55, p. 97), swellhead of sheep and goats, and swamp fever of horses and mules.

The work with swellhead of sheep and goats indicates that the disease has a direct relation to malnutrition or deficiencies in the feed or diet of the animals. The losses in Texas during the year were light, as drought made it necessary for ranchmen to feed their sheep and goats. Of 60 sheep treated for swellhead on the range near Sanderson, 90 per cent recovered. Treatment consisted of the administration of 3 oz. of Glauber salts in 1 qt. of warm water, followed on each day until the animal went on feed by a level tablespoonful of a mixture consisting of 1 lb. of powdered nux vomica, 2 lbs. of powdered gentian root, and 0.25 lb. of powdered aloes, in 1 pint of water.

Digest of comments on the Pharmacopoeia of the United States of America and on the National Formulary, A. G. DuMez (*U. S. Pub. Health Serv., Hyg. Lab. Bul. 144 (1926), pp. XVI+272*).—This continues for 1922 the series previously noted (E. S. R., 52, p. 177).

The common chokecherry (Prunus demissa) as a plant poisonous to sheep and cattle, C. E. Fleming, M. R. Miller, and L. R. Vawter (*Nevada Sta.*

Bul. 109 (1926), pp. 30, pl. 1, figs. 8).—This is a report of studies of *P. demissa*, a bush or small tree with dark-green glossy leaves, and bearing masses of white flowers in long clusters in the spring and a profusion of small purple cherries in similar clusters in the autumn. It grows in hillside thickets or in dense masses around moist spots on canyon slopes or as a tall shrub or small tree among willows, poplars, and alders along the mountain streams. Under certain grazing conditions it is poisonous to sheep and cattle, the leaves being poisonous from the end of April to the end of August, when they become less dangerous and by October have lost their poisonous properties. Cattle and sheep do not relish the chokecherry leaves and will not eat them unless driven to do so by hunger, but fatal poisoning occurs on ranges where drought and overstocking strip the range of grass and other forage. In experimental tests with cattle a fatal dose for a 500-lb. animal was about 1.5 lbs. of the leaves. A sheep may be killed by a little more than 0.25 lb.

"The fatal quantity must be eaten in one feeding, for the poison is thrown off rapidly by the animal's system, it does not accumulate, nor does the animal become immune to the poison by eating small quantities of the leaves daily. Because the poison is thrown off so rapidly, the animal may eat in the course of the day, in small lots, several times the fatal dose without being poisoned. This explains the fact that chokecherry bushes are often grazed without causing any losses of livestock.

"The poisoned animal becomes very uneasy, staggers, falls, goes into convulsions, breathes with increasing difficulty with eyes rolling and tongue hanging out. Then it becomes quiet, bloats, and dies, usually within less than an hour after eating the leaves. The active poisonous principle of the chokecherry is hydrocyanic (prussic) acid. It is given off from certain chemical compounds in the crushed and moistened mass of leaves in the animal's stomach. The post-mortem conditions are those usually found in cases where death is due to suffocation. The lungs are heavy with blood, the mucous membranes of the mouth are blue. When the stomach is opened and the contents are stirred, a strong odor of prussic acid will be observed."

The bulletin contains a second, technical, section (pp. 25–30), one part dealing with the active poisonous principle of the chokecherry (*Prunus demissa*), by M. R. Miller, and the other with post-mortem conditions in cases of chokecherry poisoning, by L. R. Vawter. A method for the estimation of hydrocyanic acid is described.

Rayless goldenrod (Aplopappus heterophyllus) as a poisonous plant, C. D. Marsh, G. C. Roe, and A. B. Clawson (*U. S. Dept. Agr. Bul. 1391 (1926), pp. 24, figs. 10*).—Following an historical introductory account of the rayless goldenrod and of the disease of cattle and horses known throughout the Pecos Valley of New Mexico and Texas as alkali disease or milk sickness, a description is given of the plant and a detailed report of experimental work.

It is pointed out that the cause of the disease has been obscure, and that it has been thought to be produced by drinking alkali water, by a pathogenic organism, or by a poisonous plant, particularly the one here considered.

The experimental work here reported has shown that cattle, horses, and sheep, when given sufficient quantities of rayless goldenrod, develop all the typical symptoms of alkali disease or milk sickness. The toxic doses have been determined, and the conditions under which poisoning is liable to take place are discussed. It is shown that the toxic substances may be excreted in milk, and that calves and lambs may be poisoned in this manner. It is thought probable that human cases of milk sickness arise from the consumption of milk or butter from cows feeding on the rayless goldenrod. Since

stock eat the plant only when confined in pastures where there is little good forage, the obvious remedy is to see that the animals are well fed. It is entirely practicable also to dig out the weed in fenced pastures.

Is Bacterium abortus pathogenic for human beings? I. F. Huddleson (*Jour. Amer. Med. Assoc., 86 (1926), No. 13, pp. 943, 944*).—In this contribution from the Michigan Experiment Station the author reports upon three cases. In two of these *B. abortus* of bovine origin was undoubtedly the etiologic factor concerned in the manifestation of symptoms similar to those of undulant fever, and *Micrococcus melitensis* may have been responsible for the manifestation of a mild form of the disease in the third case. An agglutinin absorption test performed on the blood serums in the third case, however, as well as in the second case, placed the causative organism in the group of *B. abortus*, mainly of bovine origin.

Wild carnivores as hosts of the trematode previously found in dogs as the result of salmon poisoning, E. B. Cram (*North Amer. Vet., 7 (1926), No. 7, pp. 42, 43*).—The author records the finding of specimens of *Nanophyes salmincola* Chapin in the small intestines of the coyote, raccoon, and lynx (E. S. R., 55, p. 176).

A comparative study of strains of Clostridium chauvoei obtained in the United States and abroad, J. P. Scott (*Jour. Infect. Diseases, 38 (1926), No. 3, pp. 262–272*).—This is a contribution from the Kansas Experiment Station. The author concludes from a review of previous work that *C. chauvoei* is the primary cause of blackleg in cattle, and that *C. oedematis* and other anaerobes may be associated with it.

Pathogenicity tests show that *C. chauvoei* is highly pathogenic for cattle, but that injections of *C. oedematis* and *C. novyi* are nonpathogenic for these animals. Filtrates and muscle extracts from cases of blackleg caused by typical *C. chauvoei* cultures are shown to be nontoxic. *C. chauvoei* does not produce a soluble exotoxin. Biologic products made from pure nontoxic strains of *C. chauvoei* are shown to be highly efficient, while toxic products and those made from atypical products are of little or no value.

Strains obtained from California, Scotland, France, Germany, and Switzerland are shown to be identical with the Kansas type strains. Reports from other workers indicate that the organisms causing La Mancha in Argentina, Manqueira in Brazil, and blackleg in South Africa and Australia are also the same. Four strains of *C. chauvoei* obtained from different sources are shown to be atypical.

C. chauvoei is shown to be a diffident saccharolytic organism fermenting glucose, lactose, and sucrose under favorable conditions. *C. oedematis* is seen to be a vigorous saccharolytic organism which ferments all sugars under favorable conditions, but under adverse conditions ferments only glucose, lactose, and salicin. *C. novyi* is shown to blacken unfiltered gelatin. The agglutination reactions correspond fairly closely with the fermentation reaction tests.

From a study of the pathogenicity tests, the immunization tests, and the field use of blackleg aggressin and filtrate produced from typical strains, it is suggested that the inclusion of atypical strains, *C. oedematis* strains, or intermediate types, while being theoretically advisable, would not increase the efficiency of the pure products to any appreciable extent. The use of about 250,000 doses of blackleg filtrate (E. S. R., 54, p. 574) and of several million doses of blackleg aggressin (E. S. R., 45, p. 784) produced from Kansas type cultures has been followed by a loss of less than 1 in 10,000. These products have been used successfully in all parts of the United States, in Central America, Argentina, and South Africa.

The isolation of a crystalline protein with tuberculin activity, F. B. Seibert (*Science, 63 (1926), No. 1642, pp. 619, 620*).—The author reports that he has found in tuberculin a protein which can be crystallized, and that this crystallized protein apparently is able to elicit a tuberculin skin reaction.

The organism associated with specific infectious cystitis and pyelonephritis of cows, F. S. Jones and R. B. Little (*Jour. Expt. Med., 44 (1926), No. 1, pp. 11–20, pl. 1*).—The authors report studies of a Gram-positive diphtheroid isolated from spontaneous cases of cystitis and pyelonephritis of cows on five farms. The organism produces no toxin, and is not pathogenic for the ordinary laboratory animals. Cows injected intravenously with broth cultures failed to develop the disease, but small quantities of cultures introduced into the bladder by way of the urethra give rise to a typical persistent cystitis. There is evidence for a transmission of the disease by contact infection, as when the same individual curries both normal and infected cows.

Studies in life history and control of hog lungworms, G. Zebrowski (*Ind. Acad. Sci. Proc., 40 (1924), pp. 353–366, fig. 1*).—This paper supplements a preliminary report published two years previously (E. S. R., 49, p. 80), and deals further with the life history and bionomics of the two hog lungworms *Metastrongylus apri* and *M. brevivaginatus*.

***The histological changes in lung tissue of swine produced by Metastrongylus elongatus*, S.-L. Hung** (*North Amer. Vet., 7 (1926), No. 1, pp. 21–23, figs. 3*).—The author found a marked hypertrophy of the mucous membrane and muscularis of the bronchi infested with *M. elongatus*. Around the bronchi there was a very marked proliferation of lymphatic tissue; also bronchopneumonia and emphysema were frequently present.

Roup, chicken pox, and bronchitis, F. R. Beaudette (*New Jersey Stas. Hints to Poultrymen, 14 (1926), No. 10, pp. 4*).—This is a practical summary of information with recommendations for control.

Fours years of vaccination against fowl cholera [trans. title], **A. Staub** (*Ann. Inst. Pasteur, 39 (1925), No. 12, pp. 962–968; abs. in Trop. Vet. Bul., 14 (1926), No. 2, pp. 69, 70*).—The author reports upon experimental work with a Pasteurella derived from a rabbit, which he states is innocuous for fowls. The virulence of the organism was restored by passage through guinea pigs inoculated intraperitoneally, and then tested on fowls and found to be harmless, and was used as a vaccine. The data presented show that the vaccine not only protected healthy birds, but that in some cases birds which were actually ill recovered.

Studies in transmission of bacillary white diarrhea in incubators, W. R. Hinshaw, C. W. Upp, and J. M. Moore (*Jour. Amer. Vet. Med. Assoc., 68 (1926), No. 5, pp. 631–641*).—In the studies here reported, which were conducted at the Kansas Experiment Station, it was found (1) that bacillary white diarrhea was disseminated by artificially infected chick down placed in a forced-air-draft type of incubator, (2) that chicks hatching in the compartment opposite to the one in which infected down was spread did not suffer as high a percentage of mortality as chicks hatching in the infected compartment, and (3) that similar results were obtained by infecting the down of hatching chicks and exposing healthy chicks to the down which might be carried from the infected chicks to the noninfected.

A parasitic nematode as the cause of losses among domestic geese, E. B. …m (*North Amer. Vet., 7 (1926), No. 1, pp. 27–29, figs. 4*).—The author's …igations during a serious outbreak of a disease caused by a parasitic …e in a flock of domestic geese in the central part of New York has …*idostomum anseris* to be the cause.

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The pathological significance of gizzard-worm disease of geese, H. BUNYEA and G. T. CREECH (*North Amer. Vet., 7 (1926), No. 6, pp. 47, 48, figs. 2*).—This is a brief report on the pathology of the affection of geese caused by *Amidostomum anseris*, which is of common occurrence among geese in Europe and is reported above by Cram as occurring in the United States. It is pointed out that it is principally young geese that are visibly affected, and that these may manifest serious symptoms as early as three weeks after hatching.

Studies of Salmonella pullora, R. E. REBRASSIER (*Jour. Amer. Vet. Med. Assoc., 68 (1926), No. 5, pp. 603–621*).—In this report of studies conducted by the department of veterinary pathology of the Ohio State University, the author concludes that in the identification of *S. pullora* it is essential, in addition to studying its special morphological characteristics, to ascertain its fermentation activities in dextrose, mannite, lactose, and maltose.

"There exists an interagglutinability between *S. pullora* and other intestinal organisms. This may reach a titer of 1–80 with the sera of some of the organisms. It is evident, therefore, that it is not safe, in applying the agglutination test for *S. pullora* infection, to use a titer lower than 1–100. The results obtained in the interagglutinability of *E. sanguinaria* and *S. pullora* indicate that the agglutination test for the latter is not specific, as serum from *E. sanguinaria* has a high agglutinative titer for *S. pullora* antigen. This, however, does not necessarily lessen the value of the practical application of this test, as it is quite as desirable to eliminate carriers of *E. sanguinaria* infection as those of *S. pullora*. It is evident that the blood of chickens normally contains agglutinins for *S. pullora*. The normal agglutinative titer is 1–10, and in the application of the agglutination test for this infection it would not be advisable to use a titer that was not well above this range. The so-called pseudoagglutinations in the application of the macroscopic agglutination test for *S. pullora* infection can be controlled by the use of antigens which have no phenol added as a preservative."

Experimental amoebiasis in the rabbit, M. D. THOMSON (*Calif. Univ. Pubs. Zool., 29 (1926), No. 2, pp. 9–23, figs. 5*).—The author reports that of three rabbits fed mature cysts of *Endamoeba dysenteriae* obtained from chronic human cases of amoebiasis, one acquired an infection and died 30 days after the initial feeding. No cysts were found in the stools during experimentation, nor at autopsy in the intestine of the infected rabbit, the infection being localized in the cecum. None of five dogs fed human feces containing mature cysts of *E. dysenteriae* became infected.

AGRICULTURAL ENGINEERING

[Agricultural engineering studies at the California Station] (*California Sta. Rpt. 1925, pp. 32, 33*).—It is reported by A. H. Hoffman that studies on air cleaners for internal-combustion engines have shown conclusively that there is a wide difference in dust concentration at different points under the hood of an automobile.

An extensive investigation by E. J. Stirniman on the rate of flow of grain treated with copper carbonate dust through the feeding mechanism of two standard types of drills showed that treated grain flows more slowly than untreated grain, and that the percentage of retardation varies with the variety of wheat and type, amount, and kind of treatment. The speed of the drill and the shape, size, and fullness of the seed box affected the rate of seeding only slightly.

Preliminary index to river surveys made by the United States Geological Survey and other agencies, B. E. Jones and R. O. Helland (*U. S. Geol. Survey, Water-Supply Paper 558 (1926), pp. IV+108, pls. 2*).—This compilation has been prepared primarily for the use of Government bureaus to afford information concerning the rivers on which surveys have been made and the character of the maps available. This list embraces not only all the rivers surveyed and maps published by the U. S. Geological Survey, but also many maps made and published by other Government agencies and the several States.

A study of the Colorado River silt, J. F. Breazeale (*Arizona Sta. Tech. Bul. 8 (1926), pp. 161–185*).—Studies are reported which indicate that the silt, as it floats in the Colorado River, seems to be dispersed, that is, the colloidal particles seem to be carrying negative charges. It is stated that in many cases the silt-carrying capacity of a stream may depend upon the size of the particles in suspension rather than upon the velocity of the current. It is considered probable that the colloids in this silt were dispersed when they existed in the soils in the upper watershed before erosion. The silt, as it is deposited in the lower basin, was found to contain appreciable amounts of replaceable sodium, indicating the presence of dispersed colloids.

The quality of the Colorado River water was found to vary with the flood. At low water it has a high salt content and contains an excess of gypsum, but during the spring flood its concentration of soluble salts is low, and it may even carry a slight excess of black alkali.

The hydroxides of sodium and potassium when added to the water in low concentrations dispersed the silt but flocculated it when added in high concentrations. The hydroxides of calcium and barium seemed to be inert in very low concentrations, but flocculated the silt at and above concentrations of about 40 parts per million of hydroxide. Sodium and potassium hydroxides seemed to be associated with both flocculation and dispersion, while calcium and barium hydroxides seemed to be associated with flocculation only.

Calcium sulfate flocculated the silt at and above concentrations of about 100 parts per million, but seemed to be relatively inert at lower concentrations. It was found that although the Colorado River water usually contains an excess of calcium sulfate it does not always carry sufficient amounts to flocculate the silt. Sodium sulfate and sodium chloride were found to have a flocculating effect upon the silt, but seldom occurred in sufficient amounts to make them effective.

It is concluded that the quality of the water as well as the velocity of the current should be taken into consideration in many of the engineering problems which involve the silt-carrying capacity of streams.

Drainage and flood-control engineering, G. W. Pickels (*New York and London: McGraw-Hill Book Co., 1925, pp. X+450, figs. 154*).—This book deals with the improvement of small areas of cultivable lands by underdrainage and with the reclamation of large areas of wet and overflow lands by surface drainage and by flood control. It contains chapters on precipitation, flood run-off, stream discharge measurements, flow of water in open channels, flow of water in tile drains, land drainage by open channels, soil physics, underdrainage, pumping plants for drainage districts, flood protection by channel improvement, flood protection by levees, flood prevention by reservoirs, excavating machinery, and drainage law.

Structures used in draining agricultural land, L. T. Jessup (*U. S. Dept. Agr. Bul. 1408 (1926), pp. 32, pls. 2, figs. 19*).—This bulletin describes the principles of design indicated by practice and experiment to be the most

satisfactory in the reduction of cost and maintenance expenses and in increase in the efficiency of drainage systems.

Distintegration of Portland cement in sulfate waters, T. THORVALDSON, R. H. HARRIS, and D. WOLOCHOW (*Indus. and Engin. Chem., 17 (1925), No. 5, pp. 467–470*).—Studies conducted by the University of Saskatchewan are reported.

The data on the action of sodium sulfate on Portland cement indicate that, although the main action is the extraction of lime from the cement, during the later stages both silica and alumina are removed, owing possibly to the slight solubility of the hydrated aluminates and silicates in the liquids and to the formation of stable colloidal suspensions. The extraction is speeded up in the presence of sodium sulfate and the effect increases with the concentration, but there was no evidence of a difference in the nature of the reactions involved with water and with solutions of sodium sulfate. Under the conditions of the experiment, it appeared likely that in either case all of the calcium can be extracted by continued treatment. This is taken to indicate the importance of making impervious concrete even when in contact with fresh water only.

Further experiments showed that the presence of chlorides is not a contributing factor in the disintegration of cement by sulfates. Although solutions of sodium chloride alone produced a marked increase in alkalinity over that produced in distilled water, yet a solution that was 0.5 molar with respect to both sodium sulfate and sodium chloride did not give an increase in alkalinity over 0.5 molar solution of sodium sulfate. As far as disintegration of cement in sulfate solutions was indicated by the increased liberation of free calcium hydroxide from the cement, it appeared that the presence of sodium chloride in 0.5 molar solution of sodium sulfate had no effect.

Data on the action of magnesium sulfate showed that this material reacts with the lime liberated through the natural hydration of the cement, and that the products are removed on account of their slight solubility. The liberation of free lime is consequently speeded up and continues until all the available lime has been removed and has reacted with the magnesium sulfate. The high percentage of lime removed indicated that if ultimate products of hydrolysis containing lime are formed, the calcium in these is at least partly replaced by magnesium.

It was found that in mixtures of sodium and magnesium sulfate the magnesium sulfate disintegration controls as long as there is any of that salt present. The sodium sulfate disintegration can begin only after the magnesium sulfate is removed and the alkalinity rises.

The data are also taken to indicate that the complete disintegration of Portland cement may take place in sulfate solutions without crystallization of substances, with a resultant increase in volume, having any important influence. On the other hand, it is pointed out that under certain conditions, especially when a structure is exposed to alternate drying and wetting, such crystal formation and frost action represent the final cause of the disruption of material already weakened through chemical disintegration.

Summary of results of laboratory experiments with different wood preserving antiseptics, S. KAMESAM (*[Indian] Forest Bul. 64 (1925), pp. [2]+28, pls. 4, figs. 25*).—The results of 14 years of experiments comparing different kinds of antiseptics for the preservation of Indian woods are presented in some detail (E. S. R., 39, p. 452).

Field tests with arsenic treatments were satisfactory and cost less than coal-tar creosote treatments. This was especially true in the case of the softer

woods. However, the lives of all of the harder woods were not increased by arsenic treatments. Coal-tar creosote treatments gave better results than oil emulsions or salt solutions. Earth oils had a good waterproofing effect, and it is thought that they may be mixed with coal-tar creosote with advantage. No one preservative apparently possessed all of the requirements which would make its use applicable to all conditions.

Progress report on engine-starting tests, J. O. EISINGER (*Jour. Soc. Automotive Engin., 18 (1926), No. 2, pp. 147–152, figs. 12*).—Continuing previous experiments at the U. S. Bureau of Standards (E. S. R., 53, p. 685), it was found that within certain limits richness of the fuel determines the number of revolutions the engine must make before an explosion is obtained. Richness of the mixture in the cylinder rather than that of the mixture leaving the carburetor was found to determine whether or not an explosion will occur. This is believed to be a function of the delayed vaporization of fuel left in liquid form in the manifold and cylinder during previous cycles.

A method of determining the dew points of fuel-air mixtures, R. J. KENNEDY (*U. S. Dept. Com., Bur. Standards Sci. Paper 500 (1925), pp. 47–63, figs. 10*).—A method is outlined for determining the minimum temperatures necessary to keep a mixture of fuel and air, as used in internal-combustion engines, completely vaporized. The theory of the method is based on the assumption that the initial condensate in equilibrium with the remaining vapor is of essentially constant composition for the range of pressures and temperatures encountered in the engine manifold. The Clausius-Clapeyron equation and the ideal gas laws are then applied, and an expression is developed for the temperature sought in terms of the pressure and mixture ratio of the fuel-air mixture. The expression involved several constants characteristic of the fuel, which are determined by experimental methods.

The method was applied to different fuels to compare it with other methods. It was found, for instance, that the condensation temperature of alcohol secured with the method agreed to within less than 1° C. with those computed from Smithsonian physical tables of vapor pressures. It is considered conservative to estimate that the results obtained by this method are correct to within about 2°.

Charts for studying the oil film in bearings, G. B. KARELITZ (*Mech. Engin. [New York], 48 (1926), No. 2, pp. 128–131, figs. 5*).—Charts are presented which provide a means of determining with sufficient accuracy the shape and pressures in the oil film for bearings under different conditions.

A machine for comparing the lubricating properties of oils at high pressures, C. F. MARVIN, JR. (*Jour. Soc. Automotive Engin., 17 (1925), No. 3, pp. 287–289, figs. 5*).—In a contribution from the U. S. Bureau of Standards a special machine is described for investigating the behavior of various lubricants, cutting compounds, and bearing materials under high bearing pressures. The tests made with the machine have so far been in the nature of preliminary tests to determine the possibilities of the machine as a tester of oiliness and of cutting lubricants.

The data indicate that with smooth and accurate grooves and balls, consistent and reproducible results can be obtained. They also show decided differences in the friction reducing properties of different oils below the point of noticeable abrasion. Beyond this point the friction varies widely as the rubbing surfaces wear, and no consistent values of the coefficient have been obtained. The character of the abrasion was of interest, however, as it seemed to be related to the nature of the lubricant.

The effects of engine operation on lubricating oil, L. T. WAGNER (*Jour. Soc. Automotive Engin., 17 (1925), No. 3, pp. 263–267*).—Data are reported

which indicate that the three major effects of engine operation on oil are complete destruction of part of the oil, physical and chemical changes in the oil, and contamination of the oil by foreign matter.

It is pointed out that the volatility of lubricating oil is important, since it must be converted into a gas before it can burn. The flash test, however, is of little value, and may be misleading, as it does not indicate the volatility of the entire mass. Ordinary temperature changes do not permanently alter the viscosity of an oil, but the specific viscosity is changed by relatively high temperature and by contamination.

Deterioration and reclamation of used automobile crank-case oil, A. E. FLOWERS, F. H. MCBERTY, and R. REAMER (*Indus. and Engin. Chem., 17 (1925), No. 5, pp. 481–485, figs. 3*).—Information is given on the nature and rate of accumulation of removable impurities in crankcase oil, a method and apparatus for reclaiming used oils are described, and the characteristics of the recovered oils are compared with those of new oils. A simple and rapid laboratory method is also described for determining the degree of dilution of the used oil.

A suggested remedy for crankcase-oil dilution, R. E. WILSON and R. E. WILKIN (*Jour. Soc. Automotive Engin., 18 (1926), No. 2, pp. 163–170, figs. 11*).—Studies are reported on crankcase oil dilution in internal combustion engines, the results of which suggest the use of a fairly heavy oil of from 500 to 575 sec. viscosity at 100° F., blended with from 10 to 12 per cent of a distillate having a boiling range substantially identical with that found in the average crankcase oil at equilibrium. It was found possible by this means to produce an oil with an initial viscosity around 220 sec. which gave easy starting and good cold lubrication, and yet maintained a viscosity in the optimum range throughout its entire period of service.

Power take-off for tractors, F. N. G. KRANICH (*Jour. Soc. Automotive Engin., 17 (1925), No. 3, pp. 249–253, figs. 6*).—The data contained in this report have been previously reported elsewhere (E. S. R., 54, p. 282).

Fuel costs of a private lighting plant, F. E. FOGLE (*Michigan Sta. Quart. Bul., 8 (1926), No. 4, pp. 196–198*).—Data from records on 110-volt 4-cylinder automatic electric plants are briefly summarized.

Artificial lighting of poultry houses, E. T. BROWN (*Jour. Min. Agr.* [*Gt. Brit.*], *32 (1925), No. 8, pp. 716–720*).—Experiments on the effect of lighting poultry houses of the open-front type measuring 24 by 14 ft. are reported.

The effect of lighting a house was to increase the output of eggs during the winter, although the annual production was only slightly increased. The increase in gross return was more than sufficient to pay for the extra cost of labor and lighting.

Much of the success of the system was found to depend upon the brilliancy of the lights employed. Ordinary oil lamps were of very little use, as the birds were not encouraged by the semidarkness to leave their perches, and there was not sufficient illumination to enable them to find the grains of corn in the floor litter. Gasoline burning lamps fitted with incandescent mantles were found to be excellent. Acetylene was also satisfactory, provided a sufficient number of burners were placed about the shed and efficient reflectors were fitted.

The best all-round results were obtained with electric light. For the purpose of experiment two 50 candlepower lamps were suspended 5 ft. from the floor and two 5 candlepower lamps were used as dimmers. The large lamps were kept burning from 8.30 to 9.55 p. m., when the dimmers were automatically lighted, these being suspended 2.5 ft. above the perches. These lights were used for only 5 minutes each evening to enable the birds to find their roosts after the main lights were switched off.

RURAL ECONOMICS AND SOCIOLOGY

Profit in agriculture, J. T. Horner (*Michigan Sta. Quart. B No. 4, pp. 193–196*).—The market is deemed but one factor ra fundamental cause of poor returns to agriculture. Net income the quantity of products for sale and the cost of production, a price received. Climate, soil, and equipment affect quantity and product and cost of production, but the most important fact profits from agriculture is the farmer himself.

Cost of producing field crops in three areas of Illinois, E. Rauchenstein and R. C. Ross (*Illinois Sta. Bul. 277* (192 *figs. 8*).—A study is made of the relative profitableness of cro vailing farm practices based on detailed cost records kept on farms each in Franklin and Hancock Counties for the period 1 on from 10 to 15 farms in Champaign and Piatt Counties for the 1922. The data are summarized for the entire period and for war, and post-war periods 1913–1916, 1917–1919, and 1920–1922. chosen are typical of three agricultural sections of the State ha soils, land values, and systems of farming.

The costs are grouped under the heads of man labor, horse l seed, machinery, fuel, twine, threshing, general farm expense, expense, and interest on land; and the incomes under grain or se and pasturage. The following efficiency factors were determi crop: Net cost, price, and profit per bushel or ton, yield, man an and tractor use per acre, and man labor per bushel or ton. The costs on different farms and the effect of yield and of operatin cost are discussed, and 4- and 5-year crop rotation systems are w each county.

Theory and practice in land classification, P. S. Lovejoy and *Pub. Utility Econ., 1* (1925), *No. 2, pp. 160–175, figs. 4*).—The and methods of the Michigan Land Economic Survey are desc article.

The permanent staff of this survey consists of a forester, soil s economist, and two general utility aides. Specialists in water p etc., are available if needed. Since its organization in 1922 th covered 1,500,000 acres of typical cut-over lands at a cost of 2.5 Three simultaneous surveys are made, including civil-base data, the land and related economics. Maps are prepared showing the to 10-acre plats. The economic survey includes studies of past taxes, assessments, population, tenure, colonization, exports an staples, etc.

The entire survey is planned to determine what lands are agriculture, for forests or reforestation, and for recreation purp

Renting farms in Virginia, C. C. Taylor and J. J. Vernon (*Bul. 249* (1926), *pp. 32, figs. 11*).—While the number of farms increased about 57 per cent from 1880 to 1920, the number operat decreased from 29 to 26 per cent. Tenants in 1920 operated less cent of all farms in 5 of the 100 counties of the State and ove in 24 counties, the percentages being from 50 to 61 in some tobacco, cotton, and peanut growing counties. From 1880 to 192 of cash tenants decreased from 11 to 4 per cent, while that of share tenants increased from 18 to 20 per cent. Five types straight share, croppers, cash, stock share, and standing rent—

the chief characteristics—share customarily received by landlords, share of the expenses borne and risks assumed by the landlords and tenants, net rent in the case of cash renting, etc. Recommendations are made that leases (1) be written to avoid misunderstandings, (2) be for longer than one year in order to justify tenants in building up the soil, (3) provide for payment to tenants at termination for unexhausted improvements, and (4) provide definite means for soil improvement, including soil building, crop rotation, liming, and applying fertilizer. The type of leasing system to be preferred depends upon the ability of the tenant, experience of the landlord, crops to be raised, equipment owned by tenant, risks assumed by landlord, etc. A form of proposed lease contract is included.

Taxation of land in Austria, J. V. Van Sickle (*Jour. Land and Pub. Utility Econ., 1 (1925), No. 2, pp. 215–225*).—The Austrian land tax of 1869, which is still in force, provides for an accurate survey of all lands, their classification, and their assessment on the basis of the average net income of the lands of each class. The lands are divided into 8 main classes as to cultivation, and each of these into 8 classes as to fertility. The average net incomes from lands were determined for each of the 64 classes based on the average prices and average expenses of cultivation from 1855 to 1869, excluding the 5 years of highest prices. These cadastral figures were to be revised in 1896, and every 15 years thereafter. It required 13 years and $12,000,000 to complete the assessment work. Each plat of land was allocated by a committee from a local commission. The work of the committees was reviewed by the full local commission, the provincial commission, and finally by the central commission at Vienna with a view to insuring equality between plats, districts, and provinces.

Agricultural depression, war conditions, and politics resulted in the system being greatly modified by superficial revaluations, abatements, and temporary exemptions because of damage to crops, graduated surtaxes, etc. In 1922 the land tax was assigned entirely to the use of localities with considerable local option as to its uses, changes, etc.

The building tax law and its operation is also discussed.

Agricultural loans (*North. Ireland Min. Agr. Ann. Rpt., 4 (1924–25), pp. 17, 18, 132–135*).—During the year the Ministry of Finance laid plans whereby the Ministry of Agriculture may grant loans to farmers for the purchase of bulls, agricultural machinery, erection of silos, minor land improvements, and erection of small structures. Short-time loans to replace livestock lost during the previous winter were also approved.

In general the plans provide for loans not to exceed 75 per cent of the cost, and fix a maximum and minimum that may be loaned, require the bull, machinery, or structure to be approved by the ministry, and require repayment in equal annual installments extending from 2 years for bulls, 3 years for machinery, 5 years for improvements, to 10 to 20 years for silos. Interest charges are fixed at from 5 to 5½ per cent. The regulations for loans for purchasing machinery, equipment, and bulls are set forth in detail.

Roadside markets in Maryland, S. H. DeVault and G. E. Bouis (*Maryland Sta. Bul. 280 (1926), pp. 165–201, figs. 27*).—This is a study of 275 roadside markets in Maryland in 1925. One hundred of these were typical farmers' markets located on improved highways and operated by farmers selling only farm products, most of which were grown on their own farms. The types of locations, methods of conducting the stands, products sold, advertising done, grading, standardization, displaying of products, prices charged as compared with city retail prices, operating costs, and profits are discussed, together with the essentials to success and the common abuses.

The rules and requirements of the New Jersey Bureau of Markets for standardization of farmers' roadside markets, and the by-laws of the Farmers' Roadside Stand Association of Middlesex County, Mass., are included.

A survey of marketing problems confronting Oregon creameries, D. L. JAMES and N. C. JAMISON (*Oregon Sta. Circ. 74 (1926), pp. 3–20*).—This survey was made in cooperation with the Bureau of Agricultural Economics, U. S. D. A., to ascertain the causes of and the remedies for the unsatisfactory marketing conditions for butter produced in Oregon. The manufacturing facilities of the State were found to be adequate, and the managerial and manufacturing ability compared favorably with that of other States. Competition has resulted in cream being purchased with little if any regard to grades, in butter being manufactured and marketed without regard to grades, and in the market being glutted with butter scoring from 85 to 93, with an average of about 89. Recommendations are made (1) that a law be enacted defining sweet cream and sweet cream butter, (2) that the price of cream be based on the butter produced, (3) that sweet cream be defined as first-grade cream, (4) that a large volume of uniformly high-grade sweet cream butter be developed and sold under one brand name, and (5) that a creamery federation be formed to improve manufacturing methods and to eliminate unfair and unsound practices in the purchase of cream and the sale of butter.

Protein content: A neglected factor in wheat grades, C. L. ALSBERG (*Wheat Studies, Food Research Inst. [Stanford Univ.], 2 (1926), No. 4, pp. 163–176*).—Millers are coming to buy wheat on the protein content rather than according to the official wheat grades, which take no direct consideration of protein content. The average premiums for spring wheat vary about 1 ct. per bushel for each 0.25 per cent fluctuation in protein, and have resulted often in a much wider range of prices between lots of the same official grade than between lots of different grades.

The present practice of millers in buying on protein analysis results (1) in larger risks and consequently higher expenses, due to the fact that they can not protect purchases by hedging; (2) in the large millers and dealers near terminal markets enjoying undue advantages in securing the high-protein wheats; (3) in reducing the average milling quality of wheats which are being exported, thus impairing the reputation and reducing the price of our wheat abroad; and (4) in premiums going to middlemen and not being reflected back to the raisers, especially in the case of the higher protein wheats which are generally raised by dry farmers in remote sections where the cost of production is high and diversification of crops impossible.

It is suggested as remedies that the present grades of wheat be subdivided into classes based on quality, protein content being the most important factor in determining the classes, that a simpler test for protein content be worked out so that determinations can be made at country elevators, and that sales at terminal markets be made subject to protein content as well as to grade and dockage.

Price spreads and shipment costs in the wheat export trade of Canada, K. SNODGRASS ET AL. (*Wheat Studies, Food Research Inst. [Stanford Univ.], 2 (1926), No. 5, pp. 177–202, figs. 4*).—Price spreads of prices of No. 1 Manitoba wheat in Winnipeg and Liverpool from April, 1921, to December, 1925, were found to correspond broadly to shipment costs by the cheapest available route, although within any season there were variations considerably above or below the calculable shipment costs. From August to October the relation between spreads and costs was usually erratic. From the middle of October to the middle of December, the period of heaviest movement, spreads and costs were quite closely related, and the spreads equaled the costs in normal years. From

December to April the relation was erratic, but the spread averaged considerably below the all-rail shipment costs to Atlantic ports. From April to July the relationship was fairly definite and tended to equalize.

Appendixes are included showing the prices of No. 1 wheat at Winnipeg and Liverpool by weeks, the monthly average, the Lake freight rates, ocean freight rates, total costs of shipping by various routes, foreign exchange rates, and the annual gross exports of wheat from Canada during the years stated.

[Irish egg prices and trade], J. BUSTEED (*Univ. Col., Cork, Agr. Bul. 2 (1926), pp. 49–58, figs. 5*).—This is a study of the wholesale prices of eggs in Irish markets and the export of such eggs to Great Britain from 1910 to 1925.

The prices show regular annual cycles, the low points being in April and the high points in October and November. The annual fluctuation varies within approximately 40 per cent above and below the mean level.

The curve for imports from Ireland, making allowances for one month lag between production and importation, corresponds very closely to the production curve for hens laying less than 100 eggs in 365 days. This shows that the bulk of the Irish eggs are being sold at the lowest prices that prevail during the year. National cooperative marketing and improvement in the type of hens kept should result in a more uniform market and better prices for Irish eggs.

Crops and Markets, [June, 1926] (*U. S. Dept. Agr., Crops and Markets, 5 (1926), Nos. 23, pp. 353–368; 24, pp. 369–384; 25, pp. 385–400; 26, pp. 401–416*).—Each number contains a brief summary of market information and receipts and prices, with summaries and comparisons for livestock, meat, and wool, fruits and vegetables, dairy and poultry products, grain, hay, feed, and cotton for the preceding week; brief articles on the trade in certain products; and notes on crops and the market situation in foreign countries.

***Monthly Supplement to Crops and Markets*, [June, 1926]** (*U. S. Dept. Agr., Crops and Markets, 3 (1926), Sup. 6, pp. 161–192, figs. 2*).—The usual tables, reviews, and charts are included for crop conditions (June 1); wheat inspected for export; conditions of Florida and California crops; commercial acreage of truck crops; prices received by producers for farm products (May 15); livestock and range conditions (June 1); the livestock and meat situation (April); imports of forage-plant seeds; carload shipments of fruits and vegetables; production, prices, stocks, and exports of milk; cold-storage holdings; consumption, imports, prices, and stocks of cotton; index numbers of farm prices and wholesale prices of nonagricultural commodities; price movements of agricultural products; the price situation; and the status of world agriculture. Among the special features presented are the revised estimates by States of the cotton acreage, yield per acre, and production in 1925; the Department's estimates of the changes in farm population during 1925; tabulation by States of data as to the number of trees, ages, and varieties obtained in the peach tree survey made in the fall and winter of 1925–26; the itemized cost, averaged by geographic divisions, of producing corn, wheat, oats, and potatoes in 1925, with comparisons of the total costs in 1922, 1923, 1924, and 1925; the itemized cost of producing cotton in 1925 by different yield groups; and the prices received for different breeds of purebred cattle in 1924–1925, and of purebred hogs and sheep in 1922–1925.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Proceedings of the thirty-ninth annual convention of the Association of Land-Grant Colleges, edited by S. B. HASKELL (*Assoc. Land-Grant Cols. Proc., 39 (1925), pp. 399, pl. 1, figs. 17*).—The personnel lists, committee reports,

and minutes of the general sessions and the several sections of the convention, held at Chicago, Ill., November 17-19, 1925, and discussed editorially (E. S. R., 53, p. 701), are published here. The following papers and addresses, together with discussions, are included: The Relation of Land-Grant Institutions to the Fundamentals of Forward-Looking National Policies for the Development of Agriculture, by A. F. Woods; The Land-Grant Institutions in Their Relation to the Development of the Industries, by H. B. Shaw; The Land-Grant Institutions in Their Relation to the Development of Home-Making, by A. E. Richardson; address of W. M. Jardine, Secretary of Agriculture; The American Farm Bureau Federation, by O. E. Bradfute; Engineering Education, by F. C. Shenehon; The Services of the Land-Grant Colleges to Home Economics, by K. Blunt; The History of the Purnell Bill, by J. L. Hills and E. W. Allen; Report of the Bibliographer—Brief History of the Morrill Land-Grant College Act of 1890, by A. C. True; The Land-Grant Colleges for Negro Youth, by J. M. Gandy; Looking Backward and Forward, by W. O. Thompson; The Place of Conservation in the College Curriculum, by F. D. Farrell; Some Major Objectives in Agricultural Education, by E. C. Johnson; Curriculum Orientation to the Demands of Modern Agriculture, by R. L. Watts; The Agricultural College and the Various Demands for Leadership in the Modern Industry of Agriculture, by J. A. James; Can Correspondence Courses in Agriculture Contribute to the Development of Modern Agriculture and Home-Making? by G. Gemmell; Modern Tendencies in Methods of College Teaching, by G. A. Works; The Influence of the Purnell Act on the Development of Agricultural Research, by E. W. Allen; The Principles Which Should Characterize Sound Investigation in the Field of Agricultural Economics and Rural Sociology, by J. D. Black; Organization for and Relationships in Cooperative Research, by T. Cooper; The Function of Research in Developing a National Agricultural Policy, by F. B. Mumford; Results of Research in Land Economics that Point the Way to a National Land Policy, by L. C. Gray; Contributions of the Land-Grant Institutions to National Agricultural Progress, by B. Youngblood; The Importance of Home Work in Our Extension Program, by L. Bane; The Importance of Home Work in Extension, by T. R. Reid; Probable Developments in County Extension Organization, by B. H. Crocheron; Financing Extension Work in the Future, by A. J. Meyer; The Responsibility of Expanding the Boys' and Girls' Club Movement in Its Field of Work, by C. B. Smith; Some Aspects of a Study of Leadership, by H. C. Ramsower; The Land-Grant College Engineering Experiment Stations, by E. A. Hitchcock; Value to the Industries of Engineering Research at the University of Illinois, by M. S. Ketchum; Value to Industries of Engineering Research at Iowa State College, by A. Marston; Extension Work, University of Wisconsin, in Cooperation with Industries, by F. E. Turneaure; Value of the Engineering Research Work at the Pennsylvania State College, by R. L. Sackett; Cooperative Research in Land-Grant Colleges, by A. A. Potter; Organization of Research in Home Economics in Land-Grant Colleges, by R. E. Buchanan; Standards for Research in Home Economics under the Purnell Act, by E. W. Allen; The Administration of Home Economics Research under the Purnell Act in Institutions where Home Economics is Organized Separately from the College of Agriculture or the Agricultural Experiment Station, by R. W. Thatcher; Relation of Home Economics Research to Experiment Stations under the Purnell Act, by M. M. Justin (abs.); A State Program in Child Development, by B. T. Baldwin (abs.); and Agencies Contributing to Parent Training—Institutions such as Practice House and Nursery School by F. Rose, Parent Education Through Extension Teaching by K. G. Van Aken, and The Work of Home Education in the United States Bureau of Education by E. C. Lombard.

[Report of the meeting of the International Commission of Women's Institutes, July 18, 1925] (*Bul. Comn. Internatl. Cerc. Fermières, No. 1 (1925), pp. 37*).—The address of the president, reports of the secretary general and delegates, and the constitution for the commission proposed at the meeting at Brussels, July 18, 1925, are included.

Visual education for teachers of agriculture, S. DICKINSON (*Missouri Univ. Bul., Ed. Ser. 18 (1925), pp. 63, figs. 8*).—Visual presentation is defined as a special device or method in teaching which attempts to assist the understanding of students through some means other than the printed or spoken word. A study of visual education has two main functions: (1) To discover the principles, facts, and other data of value and (2) to secure practice in the making and use of visual materials. This bulletin discusses and outlines the uses and the making of various devices for visual presentation in connection with agricultural education.

How to make and use a balance sheet, W. POWELL (*N. Y. Agr. Col. (Cornell) Ext. Bul. 132 (1926), pp. 30, fig. 1*).—Instructions are given in this bulletin as to making and using a balance sheet, together with a list for supplementary reading relating to business management.

Preliminary report on farm household management instruction (*Rome: Internatl. Inst. Agr., 1925, pp. 15*).—*Farm household management instruction* must include more than the regular household management courses, with instruction in farm subjects added. Poor access to schools and doctors, differences as to foods available, living conditions, the purpose of the training, etc., necessitate not only different lines of instruction but different instruction on the same subjects from that given in courses in the city.

The report describes the present farm household management courses given girls in Europe under the following heads: (1) Instruction in primary schools, (2) after-school instruction, including schools at fixed centers, seasonal courses, traveling schools, clubs, consultations, etc., and (3) training schools for teachers.

FOODS—HUMAN NUTRITION

Fruit jellies.—IV, The rôle of salts, P. B. MYERS and G. L. BAKER (*Delaware Sta. Bul. 144 (1926), pp. 3–35, figs. 9*).—This continuation of the series previously noted (E. S. R., 55, p. 87) contains the complete report of an investigation of the effect on jelly formation of variations in salt concentration at constant total acidity and at constant H-ion concentration. A summary of the principal findings and conclusions in this study has been noted from a progress report (E. S. R., 54, p. 691). In addition to the salts noted in this progress report, disodium hydrogen citrate was tested by the use of standard solutions of pure citric acid and sodium carbonate mixed in theoretical amounts.

The data all point to the important rôle of H-ion concentration in jelly formation. Two possible functions of the H-ion concentration in this connection are suggested: (1) That it serves to split off the methoxy groups from the pectin and (2) that it splits off salts from the pectin molecule. Both of these theories are being investigated.

The thirtieth report on food products and the eighteenth report on drug products, 1925, E. M. BAILEY (*Connecticut State Sta. Bul. 276 (1926), pp. 331–392+II, fig 1*).—This is the customary annual report (E. S. R., 53, p. 657) of routine analyses of various food products and drugs.

Interpretation of disturbances in metabolism due to the glands of internal secretion, G. LUSK (*Endocrinology, 9 (1925), No. 3, pp. 213–220*).—This is a brief critical review of the literature on basal metabolism as affected

by the internal secretions of the thyroid, adrenal, pancreatic, pituitary, and sex glands. In the author's opinion "the subject matter of the internal secretions has in the course of its development become so complex that much has been written of it that is of purely imaginative character."

Concerning the choice of experimental animals for basal metabolism studies, it is believed that trustworthy data can be obtained on dogs and young hogs and probably on cats, but that results are questionable with rabbits, chickens, pigeons, rats, and mice.

Observations upon the effects produced in normal and parathyroidectomized dogs and herbivorous animals by injections of parathyroid extract, J. J. R. MACLEOD and N. B. TAYLOR (*Roy. Soc. Canada Proc. and Trans., 3. ser., 19 (1925), Sect. V, pp. 27–38, figs. 3*).—The experiments of Collip (E. S. R., 53, p. 563) on the effect of the parathyroid hormone on the blood calcium and on the symptoms produced have been repeated with confirmatory results, and in addition a study has been made of the influence of diet upon the effects of the extract when injected into normal animals.

The evidence obtained, although incomplete, pointed to the possibility that fat either in the diet or in the fat reserves of the body protects against the action of the extract. Guinea pigs and rabbits appeared to be immune to the action of the extract, and irregular results were obtained with mice.

Vitamins A, B, and C, S. L. SMITH (*U. S. Dept. Agr., Bur. Home Econ., 1926, pp. 23*).—This mimeographed circular consists of a table on vitamin occurrence, which is a revision and extension of the one in the monograph previously noted (E. S. R., 46, p. 863), together with a selected list of literature references on the occurrence of these vitamins and on the technique of vitamin studies.

Vitamin potency of cod-liver oils.—XVIII, Effect on vitamin potency of cold-pressing cod-liver oils, A. D. HOLMES and M. G. PIGOTT (*Indus. and Engin. Chem., 18 (1926), No. 2, pp. 188, 189, figs. 6*).—A comparison is reported of the vitamin A potency and the physical and chemical constants of six typical crude cod-liver oils of medicinal grade and of the same oils after pressing under commercial conditions by refrigeration in a brine-cooled tank. The differences in composition and biological value of the crude and pressed oil were not sufficiently marked to indicate any significant difference in the value of the oils.

A study of the effect of excessive calcium ingestion on the calcium content of tissues with and without the application of ultra-violet light, W. DENIS and R. C. CORLEY (*Jour. Biol. Chem., 66 (1925), No. 2, pp. 609–617*).—The daily administration to rabbits for periods of over a month of calcium chloride or lactate in amounts sufficient to furnish 0.18 gm. calcium daily was found not to increase the calcium content of the tissues. Simultaneous irradiation of the animals brought about no increase in the calcium content of the tissues and serum but a marked increase in that of the bones. The inorganic phosphates in the serum were highest in the group of animals irradiated without calcium salts and lowest in those receiving calcium chloride either with or without irradiation.

The action of ultra-violet light upon the growth of rats, M. E. HUME (*Brit. Med. Jour., No. 3373 (1925), pp. 341, 342*).—This paper and the one noted below form a part of a discussion on the pathological basis of treatment by irradiation held by the Section of Pathology and Bacteriology of the British Medical Association at its 1925 meeting at Bath.

The interrelationship of vitamin A and the antirachitic vitamin and the difficulty in obtaining satisfactory conditions for the study of one unaffected by

the presence of the other are emphasized. It is shown that irradiation of young rats on diets lacking in fat-soluble vitamins can not be substituted indefinitely for cod-liver oil. The length of time before deficiency symptoms are noted depends upon the food and the light treatment of the mother during pregnancy and lactation. If there has not been an abundance of fat-soluble vitamins the young, when placed on the deficient diet without irradiation, may slacken in growth in about 2 weeks and stop growing entirely in 8 weeks. If irradiation for 10 minutes daily is started at the time the animal is placed on the deficient diet, growth may continue normally for 8 or 10 weeks. With increasing periods of time before the irradiation is commenced the growth response to irradiation is proportionately shortened, and if the treatment is begun after growth has ceased there is no growth response and the symptoms of vitamin A deficiency and death appear to be hastened.

It is reported that in an experiment which has not been completed rats have been maintained in darkness on a diet deficient in fat-soluble vitamins for 4 months without treatment and for 2 months longer on the same diet with the daily addition of 0.4 gm. of spinach, which is high in vitamin A but low in antirachitic vitamin. The animals were growing slowly and were in fair condition, showing that lack of antirachitic vitamin had not decreased their resistance to infection to such an extent as lack of vitamin A would have done.

Foodstuffs irradiated with ultra-violet light: Their effect on the bone lesions of rachitic children, H. M. M. Mackay and H. F. Shaw (*Brit. Med. Jour., No. 3373 (1925), pp. 344, 345*).—The clinical value of irradiated food materials has been tested at the Queen's Hospital for Children, London, on a number of rachitic children.

During a period in which 5 control patients on a ward diet with no treatment showed no evidence of healing of the rachitic lesions, 3 patients receiving 3½ oz. daily of irradiated dried milk in place of the nonirradiated dried milk given the others showed radiographic evidence of healing, beginning in from 12 to 14 days and continuing until the healing was nearly complete at the end of 2½ months. Symptoms and clinical signs of spasmophilia in 1 of these children disappeared after treatment for 11 or 12 days. Two patients showed equally rapid progress on irradiated milk boiled for 10 minutes before serving. Irradiated flour and irradiated cottonseed oil gave inconclusive results.

Vitamin studies.—XI. Inorganic blood phosphorus and bone ash in rats fed on normal, rachitic, and irradiated rachitic diets, R. A. Dutcher, M. Creighton, and H. A. Rothrock (*Jour. Biol. Chem., 66 (1925), No. 2, pp. 401–407, figs. 3*).—This continuation of the series of studies previously noted (E. S. R., 51, p. 460) has been noted from a summarized report (E. S. R., 54, p. 392). In addition to the points brought out in the earlier report, attention is called to the possible significance of the almost immediate lowering of the blood phosphorus and bone ash on the rachitic diet as suggesting the inability of rats to store vitamin D.

Recurrent rickets, A. F. Hess (*Amer. Jour. Diseases Children, 31 (1926), No. 3, pp. 380–385*).—A summary is given of 8 cases of recurrent rickets in infants from 3 weeks to 6 months of age at the time of the first onset of the disease. In all of the cases reported a cure was promptly effected by cod-liver oil, sunlight, or ultra-violet therapy, but a return of the trouble took place several months later. In two cases the first attack was of the low calcium type and the second the low phosphorus type. The second attacks yielded to treatment as readily as the first. The cases are cited to call attention to the necessity of continuing the specific therapy, whether cod-liver oil or ultra-violet

irradiation, after all signs of rickets have disappeared, and to the advisability of administering cod-liver oil as a routine measure through the second as well as the first winter.

The prevention of rickets, H. C. Sherman et al. (*Amer. Jour. Pub. Health, 16 (1926), No. 2, pp. 139–141*).—In this annual report of the committee on nutritional problems of the American Public Health Association (E. S. R., 53, p. 161) emphasis is placed on the distinction which should be made between foods which are directly injurious to health and others which are indirectly so in that their presence in the diet may exclude other foods containing essential nutritional factors. In the opinion of the committee the possible rickets-producing effect of cereals suggested by Mellanby (E. S. R., 47, p. 270) is to be attributed chiefly to the fact that a diet consisting largely of cereals will of necessity contain less of the substances known to have positive antirachitic effect, such as egg yolk, whole milk, and fresh vegetables. The best method of preventing rickets is to maintain the normal calcium and phosphorus content of the blood serum by direct attention to the metabolism of these elements, aided by the use of antirachitic vitamin and ultra-violet light.

Incidence and treatment of rickets in a Scottish industrial area, H. S. Banks (*Med. Officer, 35 (1926), No. 10, pp. 99–101*).—In an industrial district in Scotland in which fully 60 per cent of the children from 6 months to 3 years of age brought to the child welfare center during 1924 and 1925 were found to be suffering from rickets an artificial sunlight clinic has been established. This paper summarizes the results obtained at this clinic with a series of 75 patients receiving not less than 20 exposures to ultra-violet light (both carbon arc and mercury vapor lamp) and 43 receiving shorter periods of treatment.

The treatment resulted in all cases in complete healing of rachitic lesions as noted by X-ray findings, the straightening out of bony curvatures in children up to 2½ years of age and improvement in older children, striking improvement in appetite, general health, and muscular tone, marked increases above normal in weight gains, and increases in the hemoglobin count of the blood. It is noted that in this clinic this treatment has been much more satisfactory in its results than cod-liver oil therapy, particularly in the improvement in general health.

Light and the A-body, C. E. Bloch (*Amer. Jour. Diseases Children, 31 (1926), No. 3, pp. 315–322*).—The conclusion established by animal experimentation that sunlight and ultra-violet irradiation are ineffective in the treatment of xerophthalmia caused by deficiency in vitamin A has been confirmed clinically. Two children, a boy and girl from the same family, who were suffering from xerophthalmia as the result of a diet lacking in fresh milk, milk foods, and green vegetables, were given prolonged carbon arc light and sunlight treatment with no effect. The eye trouble in the girl was promptly cured by a diet rich in vitamin A supplemented with from 5 to 10 gm. of cod-liver oil daily. With the boy it was necessary to resort to injections of a vitamin A concentrate prepared from cod-liver oil. The xerophthalmia and night blindness disappeared entirely after 3 intramuscular injections of a total of 2.75 cc. of a preparation from 20 to 30 times as concentrated as cod-liver oil.

Intercellular substances in experimental scorbutus, S. B. Wolbach and P. R. Howe (*Arch. Path and Lab. Med., 1 (1926), No. 1, pp. 1–24, figs. 16*).—This is the complete report, with microphotographs illustrating the histological changes noted, of an investigation previously noted from a summarized report (E. S. R., 54, p. 294).

Gastric secretion in experimental beriberi in the dog, M. B. Farnum (*Arch. Int. Med., 37 (1926), No. 2, pp. 212–216*).—To determine the effect of

lack of antineuritic vitamin upon gastric secretion, Pawlow pouch dogs were fed fresh diets, followed by the same diets autoclaved in an alkaline condition, and data were obtained on the volume of gastric secretion at definite intervals and on the average free and total acidity of the secretion. Two of the dogs died on the thirty-first and thirty-seventh days, respectively, of the feeding of the autoclaved diet. The third was returned to fresh diet on the thirtieth day and brought back to normal condition in 41 days. After continuing on this diet for 35 days longer, it was placed on the same diet autoclaved without the addition of alkali. On this it required 105 days to produce beriberi again.

In the three animals a decreased amount or a lowered acidity of the gastric juice was evident several weeks before the development of symptoms of beriberi.

In a comparison of the response to histamine hydrochloride stimulation of gastric secretion in dogs on fresh and autoclaved diets, it was demonstrated that from 1½ to 3 times as much histamine is required to bring about a maximum secretion of acidity in the last stages of beriberi as in normal animals. Slight changes in the same direction were noted with gastrin.

In a final experiment Harris yeast vitamin was used to supplement the autoclaved diet. On this the dog remained in good condition with normal but not excess gastric secretion.

It is concluded that the harmful effect of alkali in the autoclaving process is due to destruction of the antineuritic vitamin rather than to racemization of the proteins, and that the antineuritic vitamin is not a gastric secretagogue.

Incidence of goiter among school children, D. C. HALL, C. M. HOFRICHTER, and G. J. MOHR (*Endocrinology, 9 (1925), No. 2, pp. 137–143, fig 1*).—The results are reported of a goiter survey in King County, Wash., of 3,160 school children from 6 to 15 years of age, including 1,654 boys and 1,506 girls. Of these, 39.3 per cent were found to have some degree of thyroid enlargement, including 35.5 per cent of the boys and 43.4 per cent of the girls. At the lowest age 30 per cent of the boys and 28.3 per cent of the girls were affected. The highest incidence of goiter among the boys, 45.28 per cent, was at the age of 13 years and among the girls, 59.25 per cent, at the age of 14 years.

Endemic goitre in New Zealand, and its relation to the soil-iodine.—Studies from the University of Otago, New Zealand, C. E. HERCUS, W. N. BENSON, and C. L. CARTER (*Jour. Hyg. [London], 24 (1925), No. 3–4, pp. 321–402, pls. 2, figs. 7*).—This extensive investigation of the incidence of endemic goiter in New Zealand and its relation to the iodine content of the soil and food is of particular interest owing to the fact that, although no part of New Zealand is more than 100 miles from the sea, goiter is widely prevalent in certain sections of the country, a total of 31 per cent of the school children having some degree of thyroid enlargement.

In the section in which goiter was most widely prevalent, 14,916 children were examined of whom 61 per cent had enlarged thyroids. Curves are given showing the influence of age and sex on the incidence of goiter in this section. In the girls there was a steady increase from the age of 5, when the earliest examinations were made, up to 15 or 16 years. Among the boys the incidence at 5 years was somewhat higher than among the girls, with a very slight increase to about 12 years, followed by a rapid decrease. Definite evidence was obtained of congenital goiter and of goiter among horses, sheep, cattle, dogs, and trout in this region. The examination for iodine of various sources of water showed that in the section where there was least goiter the water supply was artesian water contaminated by sea water.

An extension of the survey throughout the whole country, together with the examination of the soil and drinking water by sections, has led to the conclusion that a definite relationship exists between the amount of iodine in the soil of any district and the incidence of goiter among children of school age in the district. The percentage incidence of goiter among school children was found to equal 6 plus the quotient of 360 divided by the amount of iodine in 10 million parts of soil, provided this did not exceed 50. A similar relationship (the incidence being about 1/20 that among school children) was shown to exist between the amount of iodine in the soil and the number of military recruits rejected on account of goiter. The apparent exception in certain localities with low iodine content in the soil and low incidence of goiter was explained by finding an unusually high content of iodine in the drinking water.

In the prophylaxis of goiter, the administration of sodium or potassium iodide following the method of Marine has been tried in certain schools but with less marked beneficial results than those reported by Marine and others. The use of iodized salt was attended by better results, and this method is recommended as the most satisfactory means of prophylaxis.

An extensive list of literature references is appended.

Endemic goiter: The lesson from New Zealand (*Jour. Amer. Med. Assoc., 86 (1926), No. 13, p. 953*).—An editorial comment on the above.

Viability and toxicogenic power of small numbers of spores of Cl. botulinum subjected to different temperatures, W. A. Starin (*Jour. Infect. Diseases, 38 (1926), No. 2, pp. 101–105*).—This study differs from previously reported studies on the resistance of spores of *Clostridium botulinum* to heat in that small instead of large numbers of spores were used. These were introduced into various media and subjected to exposure to 70, 100, and 120° C. for 10 minutes, followed by incubation for varying periods of time at room temperature, 25, and 37°, after which the usual tests for growth and toxin production were made. The media used included sweet corn of pH 7 and 6.2, peas of pH 7.6 and 5.9, spinach of pH 7.6 and 5.3, and string beans pH 7.6, with beef heart medium pH 7.8 as control. Both A and B types of *C. botulinum* were used.

In all a series of 384 cultures was made with an inoculum of 9 to 12 detoxified spores in each culture. In every instance exposure to a temperature of 70° for 10 minutes did not destroy the spores, but exposure to 100 or 120° for 10 minutes invariably destroyed them. No difference was noted in the effect of different incubation temperatures. No significant differences were noted in the different vegetables, except that in spinach growth was less rapid than in the other media even after adjustment to pH 7.6.

It is concluded that the number of spores of *C. botulinum* entering into the contamination of vegetables plays some part in the irregularity of toxin production in cans of the same pack.

Relationship of incubation temperature to viability, rate of growth, and toxin production of Cl. botulinum in different vegetables, W. A. Starin (*Jour. Infect. Diseases, 38 (1926), No. 2, pp. 106–114*).—In this study of the rate of growth and toxin production of *Clostridium botulinum* at different temperatures of incubation, corn, peas, green string beans, and spinach were used as the media, and inoculations of 1,000,000 detoxified spores were made in No. 2 cans of the material being tested and in 50 gm. of the same in sterile Pyrex tubes. Incubation temperatures of 10 to 12, 19 to 21, and 24 to 26° C. were used for varying periods up to 5 months.

At the lowest temperature there were no recognizable changes in the appearance, acidity, or odor of the medium and almost no evidence of toxin production even after 5 months. At the other two temperatures growth and toxin

production took place, the rate of development being slightly more rapid at 25 than at 20°. Death of the organism did not take place at any temperature tested.

Of the various vegetables, corn yielded the most potent toxin, which did not diminish during 5 months' observation. In appearance the corn gradually became mushy, and it developed a butyric odor after 7 days but no odor of putrefaction. Sufficient gas was formed to cause bulging of the cans. Peas ranked next in development of toxin and showed the most marked decomposition of any of the vegetables, with abundant gas formation and the development of a putrid odor. String beans and spinach showed little change in appearance or odor, and the amount of toxin was less than in the other two. This is thought to be due to the high initial acidity of the beans and spinach.

The frequency of botulism.—A report of outbreaks from 1922 to 1926 (*Jour. Amer. Med. Assoc., 86 (1926), No. 7, pp. 482, 483*).—A brief summary is given of reported outbreaks of botulism in the United States since the report of Geiger, Meyer, and Dickson in September, 1922 (E. S. R., 49, p. 859).

The outbreaks in regard to which data have been collected in this period number 56, 24 of which have been proved toxicologically. The individual cases total 159, with 124 deaths. The food products involved so far as known were vegetables in 38, meat in 4, fish in 4, fruits in 1, and pickles in 1. Three commercially canned foods hitherto not incriminated were involved—sardines with tomato sauce canned in the West, and potted meat and peas, both canned in the Middle West. In both the commercially canned peas and potted meat the toxin demonstrated was type B.

In 36 outbreaks the food was home canned and in 11 commercially canned. Evidence as to spoilage was obtained in 41 outbreaks. Eighteen of the foods implicated were said to be normal and 23 abnormal in taste and odor and in the appearance of the container.

The relation of albuminuria to protein requirement in nephritis, J. P. Peters and H. A. Bulger (*Arch. Int. Med., 37 (1926), No. 2, pp. 153–185*).—Of particular interest in this study of protein metabolism in types of nephritis characterized by the occurrence of edema, profuse albuminuria, and reduction of the plasma proteins is the evidence advanced in six detailed case reports that by proper regulation of the diet it is possible to replace nitrogen lost as albumin. The regulation involves essentially the reduction of the nitrogen metabolism by high caloric diets, with a considerable excess of fat and carbohydrates. Levels as low as from 0.5 to 0.7 gm. of protein catabolized per kilogram per day were obtained. The protein should be adjusted to cover this minimum and to replace that lost as albumin. To a certain extent this can be increased to a point at which not only wastage is prevented but a storage of protein is possible.

Attention is called to the fact that the nitrogen metabolism in nephritic patients can not be measured by total urinary nitrogen, and can be measured from the urinary nonprotein nitrogen only after allowance has been made for changes in the nonprotein nitrogen of the blood and tissue and variations in body weight due to diuresis or accumulation of edema.

TEXTILES AND CLOTHING

Recent textile research at the Massachusetts Institute of Technology, G. B. Haven (*Natl. Assoc. Cotton Manfrs. Trans., No. 116–117 (1924), pp. 171–189*).—Studies at the institute described as typical dealt with moisture surveys, the rate of moisture regain in various fabrics, measurements of fabric porosity in felts and ducks, measurement of crimp and take-up in weaving processes,

the development of a constant load-rate textile testing machine, and abrasion and flexure in fabrics.

Studies of the bacterial decay of textile fibres, II, A. C. Thaysen and H. J. Bunker (*Biochem. Jour., 19 (1925), No. 6, pp. 1088–1094*).—When samples of rayon were exposed to the action of a culture of cellulose-decomposing bacteria, cellulose acetate and nitrocellulose rayon apparently were not attacked. While viscose rayon showed less resistance, it was yet more stable than cuprammonium rayon, which deteriorated even faster than raw cotton. Similar decay rates were noted on samples buried in a light garden soil, although nitrocellulose rayon was also affected and its resistance was only a little greater than that of viscose. All samples decayed markedly faster in sea water than in the soil, the only notable resistance to decay being shown by cellulose acetate. The differences may be due either to physical or to chemical differences in the various types of rayon.

A gravimetric method for investigation of the variation and levelness of yarn, S. G. Barker (*Jour. Textile Inst., 17 (1926), No. 6, pp. T259–T263*).—In a method described for the determination of the local variation or irregularity in count of yarns successive short lengths are weighed on a special balance. The results show up local irregularities, i. e., both thick and thin places are found. Typical results are given.

A recording extensometer, T. Lonsdale (*Jour. Textile Inst., 17 (1926). No. 5, pp. T248–T253, figs. 4*).—The instrument described for studying the properties of textile yarns and fibers records photographically the load-extension diagram of the material under test.

The extensibility and strength of different hemp varieties [trans. title], W. Müller (*Leipzig. Monatschr. Textil Indus., 41 (1926), No. 6, pp. 213, 214*).—Comparative tests made on fiber of hemp varieties from the Union of Socialistic Soviet Republics, Italy, and Yugoslavia showed substantial differences in strength, traceable partly to the material and partly to preparation. Considerable variation was noted in breaking lengths and in extensibility. Color did not affect strength, and a microscopic study did not reveal significant structural differences.

Method of evaluating the different technological qualities of cotton fibers [trans. title], F. Heim de Balsac and O. Roehrich (*Coton et Cult. Coton., 1 (1926), No. 1, II, pp. 1–29, figs. 4*).—Using a method outlined earlier (E. S. R., 46, p. 635), the authors have determined and tabulated the characteristics of several Egyptian, American, and Asiatic varieties of cotton.

Technological study of Morocco cotton [trans. title], F. Heim de Balsac and O. Roehrich (*Coton et Cult. Coton., 1 (1926), No. 1, II, pp. 39–76, figs. 20*).—Observations similar to those noted above were recorded on Porto Rico cotton (*Gossypium barbadense*) grown in three localities in Morocco and on Sar sar (*G. hirsutum*), an indigenous sort.

Tensile tests for cotton yarns, I–V (*Brit. Cotton Indus. Research Assoc., Shirley Inst. Mem., 5 (1926), Nos. 6, pp. 77–88; 7, pp. 89–101, figs. 13; 8, pp. 102–113, figs. 2; 9, pp. 114–126, figs. 3; 10, pp. 127–140, figs. 5*).—This series of papers, in which available tests are analyzed from the viewpoint of the ability of the yarn to withstand the strains imposed in industrial processes and wear, includes A Survey of Current Tests, The Ballistic Test for Work of Rupture, and The Rate of Loading, all by E. Midgley and F. T. Peirce; and The Dynamics of Some Testing Instruments and "The Weakest Link"—Theorems on the Strength of Long and of Composite Specimens, both by F. T. Peirce.

Results of spinning tests on standard Indian cottons, A. J. Turner (*Bombay: Indian Cent. Cotton Com. Tech. Lab., [1926], pp. 89, figs. 26*).—

Reports are made of extensive spinning tests with standard cottons from Bombay, Punjab, United Provinces, Madras, and Hyderabad. Mississippi and Texas cottons were included for purpose of comparison. The technique used in the laboratory is described briefly.

The effect of light on cotton [trans. title], H. KAUFFMANN (*Melliand Textilber., 7 (1926), No. 7, pp. 617, 618*).—From his experiments the author concludes that only ultra-violet rays damaged (weakened) the cotton cellulose. The altered cellulose, termed "photocellulose," had the same chemical composition as the normal cellulose.

Some further notes on the action of heat on cotton cellulose, E. KNECHT and E. F. MULLER (*Jour. Soc. Dyers and Colourists, 41 (1925), No. 2, pp. 43–47*).—Heating cotton yarns for extensive periods (1,860 and 1,914 hours) in open, sealed, and evacuated tubes gave indications that prolonged heating at 90° C. reduced yarn strength in every case, with a concurrent increase in the copper number. In a vacuum heat caused much less deterioration than heating in an open tube. Except with mercerized yarns, the copper numbers appeared low in comparison with the decrease in tensile strength, and discoloration of the cotton by heat was not commensurate with deterioration. Mercerized (caustic soda or nitric acid) cotton appeared to be more profoundly affected than ordinary cotton. An empyreumatic odor was noticed on opening the sealed tubes, and there was simultaneous formation of a volatile acid. The available oxygen was apparently not responsible for much of the changes noted.

Experiments with a temperature controlled flat iron (6.25 lbs.) indicated that the danger point of scorching new bleached calico is about 250°. The moisture relations of the cotton were important in this respect, wet cotton scorching about 8 times as rapidly as dry cotton. Rapidity of scorching depended largely on the origin of the cotton, and the fiber diameter also appeared to play some part; thus Sea Island cotton was badly scorched in a given time, Egyptian slightly less, African and Australian perceptibly, and American cotton scarcely at all. Gray cloths showed scorching in much less time (about ⅛) than after the same cloths were bleached. When these cloths were spotted with water scorching of the wetted places was almost instantaneous. Cotton mercerized and bleached scorched more rapidly than the same cotton bleached without previous mercerization, whereas some specimens of cotton bleached and subsequently mercerized did not scorch as readily as when bleached only. The temperature at which air-dry bleached cotton scorches immediately in contact with the iron was found to be about 300°, close to the ignition point.

Kemp (*Brit. Research Assoc. Woollen and Worsted Indus. Pub. 59 (1926), pp. 40, pl. 1, figs. 46; also in Jour. Textile Inst., 17 (1926), No. 6, pp. T264–T304, figs. 47*).—Included in this group of contributions are an introduction, by H. J. W. Bliss; Kemp Fibres in the Merino, by J. E. Duerden; Kemp in the Fleece of the Welsh Mountain Sheep, by J. A. F. Roberts; Kemp Fibres in Fleeces of British Breeds of Sheep, by J. S. S. Blyth; and Some Characteristics of Mohair Kemp, by H. R. Hirst and A. T. King.

Laundering of fabrics containing rayon and other synthetic fibers (*Amer. Dyestuff Rptr., 15 (1926), No. 10, p. 397*).—Investigations under the auspices of the National Association of Cotton Manufacturers resulted in the development of a satisfactory washroom procedure and washroom formula, outlined in this article.

Methods and equipment for home laundering (*U. S. Dept. Agr., Farmers' Bul. 1497 (1926), pp. II+37, figs. 10*).—This revision by the Division of Textiles and Clothing, Bureau of Home Economics, of Farmers' Bulletin 1099 (E. S.

R., 43, p. 792) includes practical suggestions for the arrangement of a home laundry and the selection and care of washing, drying, and ironing equipment; a discussion of laundry supplies, such as soaps, water, starches, and bluing; and directions for laundering white and colored cottons and linens, woolens, silks, rayon, lace curtains, and pillows. Special directions, with recommendations from the U. S. Public Health Service, are given for the handling of infected clothes.

Handbook of sewing for women, E. W. HAUTER (*N. Mex. Agr. Col. Ext. Circ. 90 (1926), pp. 32, figs. 34*).—Simple directions prepared for use in cooperative extension work are given.

HOME MANAGEMENT AND EQUIPMENT

Water supplies and sewerage systems for farm residences (*[Minneapolis]: Minn. State Bd. Health, Div. Sanit., 1925, pp. 46, figs. 29*).—Practical information on water supplies and sewerage systems for farm residences in Minnesota is given.

Waterworks for Texas farm homes, M. R. BENTLEY (*Tex. Agr. Col. Ext. [Bul.] 67 (1926), pp. 16, figs. 36*).—Water supply systems adapted to farm home conditions in Texas are described and illustrated.

Results of laboratory electric range studies, M. RAPP (*Iowa Agr. Col. Off. Pub., 24 (1926), No. 32, pp. 9–11, fig. 1*).—Experiments conducted at the Iowa Experiment Station are briefly reported which indicate that on the closed type of unit water is heated at the least cost with aluminum teakettles, while with the open type of unit the copper and nickel teakettle is the most economical.

A 5-lb. beef roast cooked by means of an insulated cooker unit required less than half the amount of fuel used by the oven in cooking the roast. At 5 cts. per kilowatt-hour the oven cost was 8.8 cts., and the insulated cooker unit cost 3.7 cts.

A comparison of insulated ovens for baking potatoes showed that the oven with little insulation required almost twice the amount of fuel for this process as the oven which was heavily insulated. These results are taken to indicate that while the original cost of the insulated oven is greater than that with little insulation, the saving in fuel may tend to equalize this expense in time.

The conclusion is drawn that the most efficient utilization of the range oven is accomplished by careful planning in the use of the oven for long processes, as a large amount of fuel is consumed in preheating the oven to a baking temperature.

MISCELLANEOUS

Report of the [California] Agricultural Experiment Station, [1925], E. D. MERRILL (*California Sta. Rpt. 1925, pp. 2+78*).—This contains the organization list, a report of the director and summary of the work of the station for the year ended June 30, 1925, including data as to projects and publications, and a summary, by B. H. Crocheron, of the work of the agricultural extension service (pp. 75–78). The experimental work reported is for the most part abstracted elsewhere in this issue.

Report of the director [of Connecticut State Station] for the year ending October 31, 1925, W. L. SLATE, JR. (*Connecticut State Sta. Bul. 274 (1926), pp. 189–211, figs. 10*).—The work of the station during the year is briefly reviewed. The work with soils is noted on page 320 of this issue.

Report of Northwest Experiment Station, Crookston, 1924, C. G. SELVIG (*Minnesota Sta., Crookston Substa. Rpt. 1924, pp. 77, figs. 16*).—The experimental work reported is for the most part abstracted elsewhere in this issue.

Thirty-eighth Annual Report [of Texas Station], 1925, B. YOUNGBLOOD (*Texas Sta. Rpt. 1925, pp. 63*).—This contains the organization list, a report of the director on the work and publications of the station, and a financial statement for the Federal funds for the fiscal year ended June 30, 1925, and for various State funds for the fiscal year ended August 31, 1925.

Report of the Virgin Islands Agricultural Experiment Station, 1925, J. B. THOMPSON ET AL. (*Virgin Islands Sta. Rpt. 1925, pp. [2]+17, figs. 4*).—This includes the organization list and reports by the director, the horticulturist, and the agronomist as to the work of the station for the fiscal year ended June 30, 1925. The experimental work reported is for the most part abstracted elsewhere in this issue.

The Quarterly Bulletin [of the Michigan Station], edited by R. S. SHAW and E. B. HILL (*Michigan Sta. Quart. Bul., 8 (1926), No. 4, pp. 161–206, figs. 8*).—In addition to articles abstracted elsewhere in this issue, this number contains the following: Index for Quarterly Bulletins, 1924 to 1926; Haying Time, by C. R. Megee; Monroe Corn Borer Substation: More Alfalfa, by J. F. Cox; and Sweet Clover.

NOTES

Colorado Station.—Effective September 1, Dr. Frederick B. Smith has been appointed associate agronomist and Dr. H. C. Hanson associate botanist. Mrs. Marjorie Peterson has been placed in charge of research in the section of home economics, with Miss Lucile Church, a 1926 graduate of the college, as her assistant. R. A. McGinty, associate horticulturist, is on leave for a year for graduate study at Cornell University, his work being taken by Richard V. Lott. Miss Miriam A. Palmer is absent on leave during the first semester taking graduate work at the Iowa College.

Connecticut State Station.—The annual field day at the Mount Carmel Farm was held July 28. The vegetable industry was given special emphasis in this year's program, with addresses by Director R. L. Watts of the Pennsylvania Station and Assistant Director H. F. Huber of the New Jersey Stations.

Connecticut College and Storrs Station.—The attendance at the 1926 farmers' week far exceeded that of any previous year. Sectional meetings were held for poultrymen, beekeepers, dairymen, livestock raisers, pomologists, vegetable growers, rural community workers, and for women. Special interest centered about August 4, when the principal speaker was Secretary W. M. Jardine of the U. S. Department of Agriculture and honorary recognition certificates were conferred on four leaders in agriculture and rural life, continuing the custom inaugurated three years ago.

Hall Dormitory, accommodating 88 men, is expected to be ready for occupancy November 1. A new poultry plant is being established for the isolation of the work in poultry genetics.

Leave of absence has been granted to Dr. L. C. Dunn, geneticist, who will spend a year abroad; G. C. White, dairy husbandman, for a year's study in part at Columbia University; and B. A. Brown, agronomist, for three months' study at the University of Wisconsin. C. A. Slanetz, Ph. D., has been appointed assistant in the department of animal diseases.

Georgia College.—A committee on research has been organized by the college with T. H. McHatton, head of the horticultural division, as secretary. The function of this committee is announced as "to correlate the scientific endeavors of the various members of the staff so that general problems may be worked out from all angles. The institution has been primarily a teaching and extension organization. The scientific work that has been conducted has been done by the departments and has not been generally organized. The organization of this research committee is the first step toward the development of a definite division of research in the institution."

Georgia Station.—William A. Morgan, who has been on leave of absence for graduate work at the University of Pittsburgh, returned to the station September 15 as assistant chemist.

Idaho Station.—G. L. A. Ruehle, assistant professor and research associate bacteriologist in the Michigan College and Station, has entered upon his duties as bacteriologist, succeeding Dr. William M. Gibbs, and is expected to give

special attention to bacteriological problems in soils and animal pathology. Walter H. Pierce has been appointed assistant plant pathologist for special work on a Purnell fund project on bean diseases. The bean industry is an important one in both irrigated and nonirrigated sections of the State.

Iowa College.—Dr. Howard S. Murphey, a member of the veterinary faculty since 1909 and for the past six years head of the department of veterinary anatomy and histology, died September 26. He was born in Ohio February 15, 1882, and received the D. V. M. degree from the Ohio State University in 1908.

Kansas College and Station.—The radio program for the College of the Air, recently announced by the extension division, includes ten-minute talks between 6.50 and 7.00 p. m. on Monday, Tuesday, Wednesday, and Friday nights on agricultural subjects, each to be conducted for a three-week period. No credit is given to students enrolled in these courses, but at their conclusion examinations may be taken and certificates awarded. The radio program also includes a daily market review, a housewives' half hour, and a question box on farm topics.

John H. Parker, professor of crop improvement, who has spent the last year in graduate study at Cambridge University under an International Education Board fellowship, resumed his duties October 1. D. D. Hill, instructor in agronomy during his absence, has accepted a graduate assistantship in agronomy. W. H. Riddell, instructor in dairy husbandry, has been granted leave of absence, effective September 1, for graduate study in the University of Minnesota, his duties to be carried by H. J. Brooks.

Millard Peck, assistant in agricultural economics in the Iowa Station, has been appointed associate professor of agricultural economics, effective July 1. Other appointments include A. E. Aldous, connected with the land classification of the U. S. Department of the Interior, as professor of agronomy, Helen W. Ford as head of the department of home economics, Margaret Chaney as associate professor in food economics and nutrition, and the following research assistants: B. H. Pubols in agricultural economics, W. H. Metzger in agronomy, Wilson S. Beardsley and John E. Foster in animal husbandry, M. H. Scott in poultry husbandry, L. A. Spindler in parasitology, and Earl Herrick in mammalogy.

Massachusetts College.—Miss Bertha L. Knight, clothing specialist in the extension service since 1925, was killed in a grade-crossing automobile accident on September 28 at the age of 40 years. She was a graduate of the University of Chicago and had occupied similar positions in Iowa and Maryland.

Minnesota University.—Norton E. Chapman, lecturer in farmers' institutes and since 1910 assistant professor in poultry husbandry, died August 11 at the age of 68 years. He was a graduate of the University of Chicago in 1885 and received the M. A. degree from Denison University in 1888. A pioneer worker in poultry husbandry in Minnesota, he had done much to promote its development, especially through the boys' and girls' clubs and his contributions to numerous farm journals.

Missouri University.—H. L. Shrader, extension poultry specialist, has resigned to accept a position in the poultry work of the U. S. Department of Agriculture.

New Hampshire College.—Dr. R. D. Hetzel has been appointed president of the Pennsylvania College.

Rutgers University and New Jersey Stations.—Dr. Sumner C. Brooks of the U. S. Public Health Service has been appointed professor of physiology and biochemistry vice Dr. Arthur R. Moore. H. O. Yates, jr., has been appointed

instructor in floriculture and will assist in a course in landscape gardening recently established. A. L. Prince, assistant soil chemist, has been appointed instructor in soil chemistry and Charles B. Howe assistant in agricultural economics.

New York State Station.—A recent announcement by the station calls attention to the progress which is being made in the special canning crop investigations begun last year. These tests are conducted on a 60-acre farm near the station grounds and are under the immediate supervision of three specialists employed for the specific purpose of assisting in solving the problems of the industry.

One of the major lines of work under way is a test of 19 different fertilizer treatments applied to canning crops grown in two rotations, one a 5-year rotation of tomatoes, string beans, beets, wheat, and clover and the other a 4-year rotation of cabbage, corn, peas, and clover. Difficulty in procuring uniformity in sweet corn for canning has led to a test of size of seed in relation to quality of crop, large, small, and mixed seed of Country Gentlemen, Golden Bantam, and Evergreen sweet corn being used. Different distances for planting sweet corn and germination methods are under test, and date and distance of planting tests with tomatoes and trials of numerous varieties and strains of peas in a comparison of yields and disease resistance are under way. Wherever possible the crops grown in these tests are handled as the grower would handle the same crops on a commercial scale.

North Dakota College and Station.—Miss Constance Leeby has been appointed research assistant of home economics in the station beginning September 15. C. Jensen has been appointed instructor in dairy products in the college and assistant in dairying in the station. C. F. Monroe, director of extension in the New Mexico College, has been appointed director of the extension service vice G. W. Randlett, resigned.

Pennsylvania College.—John Vandervort, jr., poultry extension specialist at the University of Illinois, has been appointed assistant professor of poultry husbandry extension.

Clemson College and South Carolina Station.—A division of poultry husbandry has recently been established with C. L. Morgan, associate professor of animal husbandry, in charge. A new building is to be provided, and resident instruction, investigation, and extension work will ultimately be carried on.

A. M. Musser has been appointed acting chief of the horticultural division and has been succeeded as assistant horticulturist by E. H. Rawl, extension horticulturist. T. S. Buie, acting chief of the agronomy division, has been appointed chief and given a year's leave of absence for graduate work at the Iowa College, during which time R. W. Hamilton, extension agronomist, will serve as acting chief. R. B. Richie has been appointed assistant professor of animal husbandry.

Tennessee University and Station.—*Breeders' Gazette* announces that a 50-acre estate in Clarksville has been given to the university by its owners, Mr. and Mrs. Hunter M. Meriwether, and will be utilized as a branch station for northwestern Tennessee.

Recent appointments include Miss Elizabeth Cheatham as librarian in the College of Agriculture and station, vice Miss Vera Walton; H. P. Ogden, for several years in charge of cooperative experiments in middle Tennessee, as assistant agronomist, with headquarters at Knoxville; G. A. Shuey as associate chemist; and H. L. Fackler as assistant entomologist.

Texas Station.—Substation No. 14, located 26 miles from Sonora and approximately 90 miles from the nearest railroad, held its second annual ranchmen's

round-up during the week of August 17. Approximately 2,000 people were in attendance at the meeting, which was held for the purpose of familiarizing the ranchmen of southwest Texas with the work in progress at the substation, where emphasis is given to the study of the breeding problems of cattle, sheep, and goats, the diseases of livestock, and range utilization.

At Substation No. 6, located at Denton, a strain of wheat and one of oats have been found to be outstanding and have been planted in large increase areas for distribution to farmers. These increase areas, along with comparative plats, afford an excellent basis for estimating the value of these strains under field conditions. The strain of wheat has been given the name of Denton and the strain of oats Nortex. Both of these strains are being increased in large quantity by groups of farmers in the region served by this substation.

V. E. Hafner, superintendent of Substation No. 3, located near Angleton, has resigned, effective September 1, to engage in commercial work, and has been succeeded by R. H. Stansel. E. Hobbs, entomologist at Substation No. 15, located in the lower Rio Grande Valley near Weslaco, has resigned, effective July 1.

Virginia Station.—Recent appointments include F. W. Hofmann, Ph. D., as associate horticulturist, C. L. Pickard as associate rural sociologist, and H. Farley as assistant animal pathologist. J. F. Eheart has been granted leave of absence for graduate work at Columbia University, his work as assistant chemist to be carried on by M. P. Miller.

Washington College and Station.—E. F. Dummeier has received the Ph. D. degree from the University of Chicago and has returned to the college and station as professor in agricultural economics and agricultural economist. J. L. St. John, also absent on leave for 15 months for advanced study in biological chemistry at the University of Minnesota, has returned as station and State chemist. A. F. Heck, assistant in soils, has been granted leave of absence for one year for advanced work at the University of Wisconsin.

E. E. Honey, instructor in plant pathology and assistant in plant pathology in the station, has resigned to accept a position as instructor in botany in Cornell University. Hector G. McDonald has been appointed instructor in animal husbandry.

Wisconsin Station.—Recent experiments by the station in an attempt to discover a satisfactory remedy for tapeworms in poultry indicate that kamala is nearly 100 per cent effective, has a wide range of safety, is readily obtainable although often adulterated, and can be given to the entire flock mixed with the feed or administered individually as desired. On a flock basis it is recommended that the birds be grouped by weight, fasted for from 18 to 24 hours, and fed amounts equivalent to 0.75 gm. for birds weighing from 0.5 to 1 lb., 1 gm. for birds from 1 to 3 lbs. in weight, and 2 gm. for birds 3 lbs. and over. The drug should be thoroughly mixed with one-third as much corn meal or dried bread crumbs as the flock will readily consume at one time.

For small flocks the individual treatment is preferred, doses of 0.5 gm. in gelatin capsules being recommended for birds weighing from 0.5 to 1 lb., 1 gm. for 1- to 2-lb. birds, and 1.5 gm. for birds weighing 2 lbs. or over. As the treatment is new, reports from additional tests are requested.

Wyoming Station.—Dr. E. N. Roberts, assistant research chemist, has resigned to accept a commercial position and has been succeeded by Dr. Otto McCreary as associate research chemist.

National Dyeing and Cleaning Research Institute.—An account of a projected school, research laboratory, and model cleaning plant to be erected at Silver Spring, Md., a suburb of Washington, D. C., appears in a recent issue of

the *Textile World*. This institute will be known as the National Association Institute of Dyeing and Cleaning, Incorporated. The plant is estimated to cost $125,000, to be contributed by the National Association of Dyers and Cleaners, and it is expected that equipment valued at $150,000 will be donated by members of the association. The purpose of the institute will be to advance the dyeing and cleaning industries, but considerable advantage is expected to accrue to the textile and textile finishing industries as well.

About 300 students may be trained each year in six-week courses. It is announced that research work is to be extended as rapidly as possible, giving special attention to standardization of machinery, materials, methods, and practices as applied to the dyeing and cleaning industry and to promotion of the science and art of dyeing and cleaning. One laboratory will be devoted to the analysis and study of wool, silk, linen, cotton, and other fabrics, pure, mixed, or adulterated, and leathers, furs, feathers, and other materials, in so far as these studies are related to the dyeing and cleaning industry. A bureau also will be maintained for furnishing information and assistance to dyers and cleaners in solving any difficult problems which confront them.

New Journals.—*Coton et Culture Cotonnière* is being published by the Cotton Section of the French General Colonial Agency and the Committee for the Encouragement of Scientific Colonial Research. From 3 to 4 numbers per year are contemplated to contain mainly original articles relative to the culture and utilization of cotton, with particular reference to the extension of cotton growing in the various countries of production. The initial number contains articles on Cotton and Its Colonial Production, by J. Dybowski; Cotton Production in the Mediterranean Basin, by G. Carle; and Cotton Growing and Its Possibilities in the British Empire, by W. Dunstan; and a section devoted to the work of the Cotton Section, including A Method of Judging the Diverse Technological Qualities of the Cotton Fiber, by F. Heim de Balsac and O. Roehrich, and Studies on the Cottons of Morocco; biological studies on cotton, including a contribution to the botany of the cotton plant with the collaboration of R. Heim de Balsac; and an economic review of cotton statistics for various countries.

Boletín de la Estación de Patología Vegetal is being issued quarterly by the Central Station of Vegetable Pathology at La Moncloa, Madrid. The initial number contains orginal articles entitled A Disease of Beans in Barco de Avila, by M. Benlloch and J. del Cañizo; Observations on a Pest of Pears (*Eriophyes pyri*), by P. Herce; An Aspect of the Biological Struggle, by J. Nonell Comas; and Some Notes on the Use of Mineral Oils and Other Materials, by M. Benlloch; together with abstracts, notes, and other data.

L'Industria Italiana delle Conserve Alimentari is being published as a monthly bulletin of the Royal Experiment Station for the Food Preservation Industry. The initial number contains articles on Sterilization in American Processes of Food Preservation and The Persistence of Artificial Colors in Tomato Products, together with decrees, statistics, and other data.

Ornis Fennica, the official organ of the Ornithological Society of Finland, contains in its initial number an article in German on Travel Calls of Migratory Birds, by I. Hortling, and several short articles in Finnish or Swedish.

EXPERIMENT STATION RECORD

Vol. 55 October, 1926 No. 5

The latest of the annual reports prepared by the Office of Experiment Stations on the work and expenditures of the agricultural experiment stations assembles data regarding these institutions for a period which included two events of special interest. During the fiscal year ended June 30, 1925, covered in this report, occurred the celebration of the establishment of the pioneer experiment station in this country and the passage by Congress of legislation which will ultimately treble the Federal support of the State stations and materially broaden their field of investigation. Both the commemorative exercises at New Haven and the details of the Purnell Act have been duly chronicled in these columns, but attention may well be directed once more to the striking fact that just fifty years after the beginning of the experiment station as a State enterprise in this country, Congress was so impressed with the merits of the undertaking as to recognize in this substantial way the large place which the stations have attained as factors in the Nation's agricultural development.

An idea of the progress of the stations during the half century may be gleaned from the report just issued. From the initial appropriation by Connecticut in 1875 of $2,800 per year for two years, the funds available for agricultural experimentation through this group of institutions in the 48 States increased in 1925 to $10,343,695. Of this amount $1,440,000 continued to represent the Federal appropriations under the Hatch and Adams Acts, while $5,827,871.88 was derived from State appropriations, $1,390,480.48 from sales, $427,486.63 from fees, and the remainder from unexpended balances and miscellaneous sources. The Federal appropriations thus contributed barely 14 per cent of the total for the system as a whole, while from non-Federal sources there was available 86 per cent.

The report brings out that the aggregate of the State appropriations for maintenance has been increasing steadily for several years. As in the preceding year all of the stations received some State aid, but the amounts again showed wide variations, ranging from a minimum of $1,557.20 to a maximum of $507,937.93. Five stations received less than $10,000 each from State appropriations, while in 4—California, Ohio, Illinois, and Minnesota—their respective income from this source exceeded $300,000, and the combined State appropriation for the two stations in New York was $495,054.27. In 12

States there was no change in the appropriation from the previous year, 24 showed an increase, and 14 a decrease, but for the group as a whole there was an increase of nearly $310,000.

The first American experiment station began operations in the chemical laboratory of Wesleyan University, tendered rent free by that institution, and its equipment was on a correspondingly modest scale. By 1925 the station buildings as a whole were numbered by the hundreds, their lands covered thousands of acres, and their valuations ran well up in the millions. The additions to equipment for the year are estimated at $1,475,201, of which slightly over half is classified as buildings. Aside from several large structures for the joint use of the colleges of agriculture and the stations, the new construction included a range of ten greenhouses for the California Station, respiration apparatus for large animals and an experimental greenhouse in Illinois, and provision for the purchase of additional land and the development of numerous substations in several States.

The personnel of the stations grew in the half century from a chemist and two assistants to a total of 2,415 regular employees other than laborers, or an average of about 50 persons per station. Not all of these, however, were full-time workers, over half (1,265) taking some part in the college teaching and 347 assisting in the extension work.

As the report points out, the station personnel has undergone a marked change in character since the early days because of the nature of the work and the altered demands. "When the work was more elementary, the need for funds and for suitable facilities was to a large extent the limiting factor. Workers were adapted from the teaching force, and persons of limited experience or range of training could render acceptable service for the time. But with the change in the status of research the requirements for persons of sound training and experience have been increasingly felt. This has resulted in raising the standards for new recruits in most lines, and has stimulated large numbers of prospective station workers, or those already so engaged, to prepare themselves by advanced study and contacts with the methods of inquiry. While in some branches of the work this more severe preparation has lagged behind somewhat, the improvement in most branches has been very marked, and with the expansion now provided the demand for broadly trained investigators will be considerably increased."

The passage of the Purnell Act definitely broadened the field of research in the stations. In some of the newer lines this field had hitherto been only partially organized, and a shortage of leaders delayed some of the institutions in embarking in these directions. The campaign for additional workers naturally increased the competition among institutions to some extent, and resulted in some shifting and readjustments, although the turnover for the year was not excessive.

As regards salaries, a survey of the situation in the spring of 1925 is noted, which showed for department heads, leaders of separate lines, and independent workers a salary range from $2,400 to $6,000 per annum. Both of these extremes were, of course, exceptional. In 3 States the range was from $2,400 to $2,750, and for the larger proportion it was from $3,000 to $4,500. In 7 States the maximum salary paid workers of this rank was $3,500 and in half it did not exceed about $4,000. In only 9 States was the maximum for department heads or independent workers above $5,000. As the report states, "on the whole, it can not be claimed that the experiment stations are extravagant in the matter of salaries, and the probability is that in the more advanced positions and those calling for special training the amount will have to be increased."

The work of the stations continued to be noteworthy for its wide scope and variety. The number of projects devoted strictly to research and experimentation aggregated 5,634, an average of considerably more than 100 per station. This is slightly larger than for the previous year, but shows little departure in subject distribution. Field crops again led with 1,817 projects, followed by horticulture with 952, animal production (including dairy cattle and poultry) 926, plant pathology 482, entomology 472, soils 343, agricultural economics 235, fertilizers 213, veterinary medicine 203, agricultural engineering 189, botany 144, genetics 126, dairy products 106, forestry 100, foods and human nutrition 54, and various others. There were increases during the year of 95 projects under field crops, 50 under entomology, 49 under agricultural engineering, 43 under soils, 33 under horticulture, 32 each under plant pathology and poultry, 26 under economics, 25 under forestry, and small additions under various other subjects.

The steady and general increase in the number of projects which has been so characteristic in recent years is discussed in some detail. It is shown that force of circumstances, particularly the pressure upon the stations for immediate results, has led not a few to spread their funds and their resources over a larger number of inquiries than can be prosecuted intensively and energetically. In view of the urgency of some of the problems, this condition has been quite understandable and to a certain extent inevitable. At the present time, however, the nature of the problems remaining after 50 years of more or less preliminary attack calls for intensive study. "The requirements are not met by empirical experiments which only give comparisons applicable for the time and the conditions, and are not expressed in terms showing permanent relationships."

The real advances in agricultural practice and teaching have come, as the report points out, from "the application of knowledge and understanding, gained through close study and use of all that has

been discovered by others, both as to facts and the light they throw on the real nature of the problem. Research attempts to build upon this foundation of information by making new contributions. It is needless to conduct more experiments unless they disclose something new or strengthen beliefs which need further confirmation.

"Such procedure, which aims at disclosing underlying facts and principles, has become increasingly the objective in the investigations of the experiment stations. It recognizes the broad general background which has already been provided, and the fact that agricultural investigation, like all research, is a forward-looking effort, progressing on the basis of its own and related inquiries. Naturally it is a far more exacting type of activity than the making of conventional experiments or following the routine of a long series of established trials. It calls, therefore, for concentration, the centering of effort on a few subjects, with close application to them.

"With an undue increase in number of projects the tendency is for workers to scatter their efforts over too wide a field, not to go deep enough to get the basic facts, and not to put enough of themselves into the individual experiments to be constructive. Diffuseness is one of the evils that still needs to be guarded against. The situation emphasizes the importance of the steps already taken to evaluate the projects under way and the promise they hold out, to sift them critically and set high standards of performance to which they must conform. Unless they can justify themselves by their method and the evidence or prospect of progress, they are not in harmony with the present-day program of agricultural research."

Special consideration has been given to the situation as regards investigations in rural economics and sociology and home economics in view of their increased importance in the station program since the passage of the Purnell Act. Critical study has revealed a considerable diversity of opinion and practice, but has strongly emphasized the value of a constructive purpose and definite objective in all such work as in other fields of research. "There appears to be nothing to justify the setting up of standards of work in these fields essentially different from those accepted for other lines of investigation. Because the subjects have been less studied the work may necessarily be somewhat elementary in certain respects at the outset, but the aim will undoubtedly be to make the investigation of them purposeful, thorough, and progressive."

The total number of publications issued by the stations was 1,059, including annual reports, bulletins, and circulars, aggregating 26,537 pages and distributed to 853,732 addresses on regular mailing lists. This is an increase of 25 per cent over the previous year in number of these publications, and presumably reflects the enlarged output of the stations under the stimulus in many cases of

additional funds for printing. To an increasing extent, however, other channels than the regular station series continue to be developed and a wider and more varied dissemination secured. The *Journal of Agricultural Research*, for example, contained 30 articles prepared by the stations and 9 in which they collaborated, 24 of the stations being thus represented. In addition, the stations contributed to 290 other scientific and technical journals no fewer than 1,305 articles related to or based on their work.

While the report records few spectacular happenings for the fiscal year 1925, it indicates very clearly that the period was one of steady progress for the stations as a whole and a time of much encouragement. Although the Purnell Act did not go into operation until the close of the year, it stimulated immediately the development of agricultural experimentation by assuring enlarged and increasing support from the Federal Government and broadening the scope of the stations. The closing months, therefore, became a season of preparation to meet the new opportunity. There were many indications of a desire to rise to this opportunity in the fullest measure possible, and to see to it that the legislation should usher in not merely a second 50 years of material prosperity for the stations but an era of greatly enlarged usefulness by them both to agriculture and to the Nation.

The large part which research may come to occupy in the program of an educational institution has recently been graphically shown by a compilation of the research projects in progress at the University of Minnesota for the fiscal year ended June 30, 1925. This compilation was prepared by the Graduate School of the university to include projects completed by members of the faculty and their students during the year and also the unfinished work still under way. Abstracts of each topic were requested, giving a brief indication of the purpose of the study, the methods and materials used, and the results so far as available. The data are grouped under the respective undergraduate and graduate colleges, and are issued in the hope that the results "will be of interest not merely as an indication of the relative activity of the various individuals and departments but also as a cross section of the productive scholarship of the university."

The compilation makes a volume of approximately 300 pages and embodies projects from 12 colleges and schools organized into 78 departments or comparable groups. The subject matter ranges from anthropology to mining, from astronomy to home economics, from Greek to agronomy. It is a striking epitome of the broad field covered by a modern university.

Because of the formal organization of agricultural research through the experiment station with its liberal appropriations, large prominence would be expected to be attained in this direction.

This expectation is in the main fulfilled, although the work of the station as such is not specifically set forth, since it has been reviewed in a current report of its director. The work of the college of agriculture, forestry, and home economics, however, occupies some 55 pages of the report, or nearly 20 per cent of the available space, and this includes station projects as well as those under other auspices.

The total number of projects listed for the college is nearly 250, of which fully one-fourth represent the subjects of theses for advanced degrees and a few are undergraduate undertakings. Classified by subjects the leading fields of inquiry are plant pathology, agricultural economics, and biochemistry, with nearly 50 projects each, entomology, and dairy husbandry, and with a relatively small number in veterinary medicine, horticulture, agricultural engineering, forestry, home economics, agronomy, and animal husbandry.

The wide appeal of agricultural science, however, and its dependence upon the basic sciences are alike revealed by a study of the projects of other colleges in the university. There are here listed fully 50 projects of sufficient agricultural interest to warrant inclusion of abstracts regarding them in the columns of *Experiment Station Record* when available. Many of these are in botany, where a series of projects is under way on the physiology of the tissue fluids of Egyptian and other cottons, and there are also biometric studies, tests of the regression of soil properties and crop characters in associated plats of an experimental field, and a review of the trees and shrubs of Minnesota. Numerous educational studies are being made by the department of agricultural education, which is a part of the College of Education, including an analysis of oat growing and an occupational analysis of the work of the dairy farmer. Other departments which may be mentioned for one or more studies of agricultural interest are those of animal biology, geography, history, sociology, economics, chemical engineering, anatomy, bacteriology, pediatrics, and physiology and physiological chemistry.

It is realized that conditions at the University of Minnesota may or may not be typical of the land-grant institutions as a group, and few generalizations would probably be warranted from the findings here revealed. As a whole, however, the survey unquestionably serves to make an impressive showing for research as an active factor in this institution, and indicates further that agricultural research is one of its principal concerns. The fact that some of this research is carried on outside the limits of the college of agriculture may illustrate chiefly the fact that a certain amount of overlapping of jurisdiction in science is inevitable, and that the search for truth can seldom be pent up within narrow departmental lines.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Manual of colloid chemistry for biologists and physicians, H. Handovsky (*Leitfaden der Kolloidchemie für Biologen und Mediziner. Dresden: Theodor Steinkopff, 1925, 2. ed., rev., pp. XVI+265, pl. 1, figs. 36*).—This volume, of which this is the second edition, deals with the principles of colloid chemistry. The application of these principles to the solution of biological probelms is discussed in an appendix.

The chemists' year book, 1926, edited by F. W. Atack (*Manchester, Eng.: Sherratt & Hughes; New York: Chem. Catalog Co., 1926, Amer. ed., pp. [9]+1180+[17], figs. 26*).—In this as in the previous American edition of this yearbook (E. S. R., 51, p. 501), the editor has had the collaboration of F. M. Turner, jr. The *American methods included in the section on agricultural* chemistry have been revised by A. L. Prince, and a new section on lubricants is contributed by H. Moore.

A study of wheat oil, C. D. Ball, jr. (*Cereal Chem., 3 (1926), No. 1, pp. 19–39*).—Chemical and physical constants are reported for the ether extract of wheat embryo and wheat patent flour. The average values for three determinations each are as follows: Specific gravity (25°/1° C.) 0.92485 for embryo oil and 0.96729 for flour oil, refractive index at 17.5° 1.4680 and 1.4714, saponification number 184.13 and 160.86, iodine number 123.64 and 105.43, and percentage of unsaponifiable matter 3.66 and 2.51, respectively. These data show that the oils were not identical in composition. In physical appearance the two oils were unlike, the embryo oil being light in color, clear, and limpid, while the flour oil was viscous and darkened readily on heating.

From the embryo oil a very small amount of solid material separated out on standing, while from the flour oil a considerable amount of material, as previously noted by Gortner (E. S. R., 20, p. 109), separated out almost immediately. This substance, which had been found to resist saponification, was isolated in crystalline form from the unsaponifiable fraction of the flour oil to the extent of about 0.018 per cent of the flour. On analysis it proved to contain no sulphur, nitrogen, or halogens, to have a melting point of 96 to 97°, and to give some of the sterol reactions. On prolonged saponification it yielded a substance with the same melting point as sitosterol. It is considered to be a sitosterol ester. The small amonnt of solid material separating from the embryo oil could not be identified, but was evidently not identical with that obtained from the flour oil.

Samples of wheat embryo oil have been kept for three years in well-stoppered bottles with only a slight increase in free acidity and with the development of only a trace of rancidity.

The composition of sugar beet pectin [trans. title], F. Ehrlich and R. v. Sommerfeld (*Biochem. Ztschr., 168 (1926), No. 4–6, pp. 263–323*).—An exhaustive study of the pectin of sugar beets is reported, the successive steps of the analysis being essentially as follows: From sugar beet pulp by extraction with hot water a hydropectin was obtained which, on treatment with 70 per cent alcohol, broke up into a soluble portion identified as araban and an insoluble portion constituting from 65 to 75 per cent of the material and consisting of the calcium and magnesium salts of dextrorotatory pectic acid.

From this the pectic acid was set free by hydrochloric acid and precipitated with alcohol. Analysis of this material yielded methyl alcohol, acetic acid, *l-arabinose*, *d*-galactose, and digalacturonic acid splitting up into *d*-galacturonic acid. From the proportions obtained of these substances, the conclusion is drawn that the pectic acid is triacetylarabinogalactodimethoxytetragalacturonic acid, with a molecular formula of $C_{41}H_{60}O_{37}.10H_2O$.

The chemical composition of loganberry juice, J. A. Dawson (*Canad. Chem. and Metall., 10 (1926), No. 4, pp. 81–84*).—Following a discussion of the characteristics and uses of the loganberry, data are given on its production in British Columbia from 1917 to 1924, inclusive, and on the chemical composition of loganberry juice freshly prepared under uniform conditions from berries received from four districts of British Columbia. The average results of these analyses are as follows: Specific gravity 15.6/15.6°C. 1.04213 and total solids from specific gravity 10.91 and by drying method 10.85, reducing sugars before inversion 6.48, sucrose by copper 0.02, nonsugar solids by difference 4.35, alcohol precipitate 0.44, total acidity as citric acid 2.35, ash 0.366, and P_2O_5 in ash 0.0222 gm. per 100 cc.

A comparison of the composition of the juice from fruit grown in different sections of British Columbia and of data reported by Hollingshead from the States of Washington, Oregon, and California (E. S. R., 41, p. 111) indicates that the slight differences in composition are probably due largely to differences in climatic conditions. The sugar content tends to decrease and the acidity to increase in going from the drier and warmer climate of the South to the more moist and cooler climate of the North. It is thought that the analyses of the juice should be extended further to determine seasonal variations and developments in manufacturing before adopting possible standards of quality.

A list of 15 references to the literature is appended.

The heat coagulation of evaporated milk, H. H. Sommer and E. B. Hart (*Wisconsin Sta. Research Bul. 67 (1926), pp. 47, fig. 1*).—This is the complete report of an investigation which has been noted from other sources (E. S. R., 49, p. 73; 51, p. 476).

Identification and estimation of the organic acids produced during bread dough and cracker dough fermentation, A. H. Johnson (*Cereal Chem., 2 (1925), No. 6, pp. 345–364*).—In this attempt to determine the chemical character of the acid-reacting materials accumulating in doughs during fermentation, three factors were considered as influencing simultaneously the increase in H-ion concentration—(1) the production of carbon dioxide by the yeast, (2) the liberation of acid phosphate salts through the action of phytase on the phytin of the flour, and (3) the production of organic acids by yeast or bacteria present in the dough. The rôle of each of these was studied in its relation to the total quantity of acid-reacting material produced. A preliminary study was first conducted on flour and water suspensions containing yeast, and the work was then extended to typical cracker sponges and bread dough fermented with yeast.

The flour suspensions and cracker sponges behaved alike in that the carbon dioxide produced by the yeast and the acid phosphate salts resulting from phytase activity had only a very slight effect on the final acidity. In the bread doughs on the other hand carbon dioxide appeared to be the most important single factor affecting the H-ion concentration and titratable acidity. In determining the nature of the organic acids in the various materials, the coefficients of their distribution were determined by the method of Van Slyke and Baker (E. S. R., 39, p. 613), the absence of pyruvic and succinic acids was demonstrated by suitable tests, the acetic and lactic acids were separated by distillation, and the lactic acid was determined by the method of Von Fürth

and Charnass (E. S. R., 24, p. 213). Lactic acid was found to be present to the extent of from 70 to 96 per cent in the flour suspension, from 78 to 95 per cent in the cracker sponge, and about 75 per cent in the bread dough. Acetic acid constituted the remainder of the acid in all cases.

A list of 24 references to the literature is appended.

Glutathione.—Its influence in the oxidation of fats and proteins, F. G. Hopkins (*Biochem. Jour., 19 (1925), No. 5, pp. 787–819, figs. 12*).—This paper contains a brief review of earlier work on glutathione (E. S. R., 54, p. 9) and a discussion of recent observations concerning its properties as a promoter of oxidation. Of particular interest is the peculiar relationship apparently existing between glutathione and proteins, the oxidation in this case apparently depending upon a succession of oxidations and reductions.

Antineuritic yeast concentrates, I, H. W. Kinnersley and R. A. Peters (*Biochem. Jour., 19 (1925), No. 5, pp. 820–826, figs. 2*).—In this investigation, which was concerned with the concentration of the antineuritic vitamin and the question of its identity with vitamin B, the authors adopted as the standard of comparison and measurement of the action of antineuritic preparations the equation

$$\text{Torulin activity (T. A.)} = \frac{\text{Number of days' protection after cure}}{\text{Weight in mg. of the dry preparation}} \times 100.$$

Torulin is defined as "the principle in yeast which cures symptoms of head retraction in pigeons induced by feeding upon polished rice." The technique employed was that described by Peters (E. S. R., 52, p. 462), with the various precautions outlined by him.

The fractionation of yeast described by Peters was extended by successive treatments of the charcoal concentrate with alcohol to 60 per cent, 25 per cent lead acetate, 90 per cent methyl alcohol, 10 per cent dialyzed iron, followed by N NaOH, and finally by increasing concentrations of ethyl alcohol until a fraction was obtained which was soluble in absolute alcohol. Preparations have been made in this way, the activity of which has varied between 50 and 100 T. A. By further fractionation with ether and alcohol, a fraction precipitated by four volumes of ether to one of alcohol when treated with silver sulfate in acid solution yielded an inactive precipitate and a liquid which, on treatment with silver nitrate in the presence of hydrochloric acid followed by ammoniacal silver hydroxide and treatment of the precipitate with hydrochloric acid and alcohol, yielded a preparation testing 1,190 T. A. This was found to contain ammonium chloride as an impurity. From the activity of this fraction the activity of pure torulin is estimated to lie between 10,000 and 100,000 T. A. or about 0.001 mg. per day for normal pigeons.

Two feeding experiments are reported with growth curves showing that doses of this concentrate which protected against polyneuritis for many days did not cause an increase in weight of the pigeons after cure of the polyneuritic symptoms. This is thought to support the view that vitamin B consists of two factors.

A laboratory apparatus for the wet grinding of plant tissues out of contact with air, W. A. Roach (*Biochem. Jour., 19 (1925), No. 5, pp. 783–786, figs. 2*).—An ingenious device for grinding potato tubers by means of a rapidly rotating alundum wheel to a fine pulp and filtering the pulp, the whole process in the absence of oxygen, is described and illustrated by diagram and photograph. The apparatus is considered to be suitable for the separation of cell-wall material for its chemical examination and for the estimation of the starch content of potato tubers and similar material by mechanical separation.

A modified methyl orange indicator suitable for use with artificial light, A. J. Salle (*Jour. Infect. Diseases, 38 (1926), No. 4, pp. 293, 294, pl. 1*).—The indicator described is prepared by dissolving 0.1125 gm. of methyl orange, 0.15 gm. of acid green, and 0.0375 gm. of acid blue in 100 cc. of 50 per cent alcohol and filtering the solution. The range of the indicator is the same as for methyl orange, from pH 2.6 to 4.4, but the color change from violet through gray to green is as easily seen by artificial as by natural light. A color plate is given of the successive changes in methyl orange and the new indicator at intervals of 0.2 pH through the entire range.

Standard methods for the examination of water and sewage, E. O. Jordan, J. F. Norton, G. W. Fuller, J. J. Hinman, Jr., et al. (*New York: Amer. Pub. Health Assoc., 1925, 6. ed., pp. XI+119, fig. 1*).—The present edition of this manual (E. S. R., 50, p. 804) has been prepared jointly by the committee on standard methods of the American Public Health Association and the council on standardization of the American Water Works Association through its committee on standard methods of water analysis.

Critical examination of the methods employed in silage analysis, with observations on some special chemical characteristics of "sour" silage, H. E. Woodman (*Jour. Agr. Sci. [England], 15 (1925), No. 3, pp. 343–357*).—The customary methods for the analysis of silage are reviewed, and data are presented showing their inapplicability to sour silage owing to the disturbing effect of the presence of appreciable amounts of ammonium salts of organic acids in the latter. In place of the usual determination of free volatile and nonvolatile organic acids it is recommended that total (free and combined) volatile and nonvolatile acids be determined.

In the modified method as outlined the amino acids and volatile bases are first determined on 50 cc. of the alcoholic solution by the use of Foreman's volatile base method (E. S. R., 44, p. 411), N/10 H_2SO_4 being used to determine the alkalinity of the residue after steam distillation. Following this, sufficient N/10 H_2SO_4 is added to make, with that originally used, a total equivalent to the titration value of the 50 cc. of alcoholic solution. The steam distillation is then carried on in the usual way.

The estimation of fat in blood, C. P. Stewart and A. C. White (*Biochem. Jour., 19 (1925), No. 5, pp. 840–844*).—In the method described use is made of the Rehberg microburette (E. S. R., 54, p. 10) to titrate the fatty acids liberated by hydrolysis from the fat contained in 2 cc. of blood.

The estimation of phosphorus compounds in blood, R. V. Stanford and A. H. M. Wheatley (*Biochem. Jour., 19 (1925), No. 4, pp. 697–705*).—A study is reported of the Briggs method of determining phosphorus in blood (E. S. R., 51, p. 612) with regard to its accuracy as judged by the estimation of known amounts of phosphates in pure aqueous solutions, agreement of duplicate analyses of the same blood or blood products, and the recovery of known amounts of phosphates added to blood or blood products.

In regard to the estimation of inorganic phosphates it is concluded that "small quantities of inorganic phosphate may be recovered from pure phosphate solutions, from plasma or plasma filtrate, and from blood filtrate with a probable error of not more than 5 per cent provided that approximately equal concentrations of the color-producing reagents and approximately equal temperatures are maintained; the specified degree of acidity exists in the solutions at the time the color is developing and that it is the same in both solutions; the phosphate concentrations of unknown and standard do not differ by more than about 30 per cent. Where trichloroacetic acid is present in the unknown it is balanced by an equal amount in the standard. Inorganic phosphate added

to whole blood before precipitation is not quantitatively recovered within this limit, probably owing to changes caused by the added phosphate itself, but the agreement of duplicate analyses of any particular blood, with or without added phosphate, is as good as that observed with pure phosphate solutions, plasma, or with blood or plasma filtrates."

The difficulty in converting the organic phosphorus compounds into inorganic is considered to be eliminated by conducting the nitric acid digestions on an electrical heating device adapted from an ordinary electric radiator. The technique is given for the estimation of inorganic, total, lipin, and acid-soluble phosphorus in blood, plasma, and corpuscles, with data showing that the results are accurate to within a probable error of ±5 per cent.

A method for the estimation of iodine in thyroid gland, F. A. Pickworth (*Biochem. Jour., 19 (1925), No. 5, pp. 768–772*).—Objections to various methods of determining iodine in tissues are outlined, and a new method is described which is thought to obviate some of the sources of error noted and to be particularly suited to the estimation of iodine in the thyroid gland.

Briefly the method consists in the destruction of organic matter by fusion with alkali and oxidation of the resulting iodide to iodate with permanganate solution, the removal of excess permanganate with animal charcoal, the addition of a crystal of potassium iodide, and the final titration of the iodine with thiosulphate. The technique is described in detail, with data on test experiments conducted in developing the method.

A note on an improved technique for use with synthetic diets, G. A. Hartwell (*Biochem. Jour., 19 (1925), No. 5, pp. 729–732*).—In an attempt to prepare synthetic diets of a consistency approaching more closely that of natural diets, two methods were tested. The constituents of the diet were caseinogen 20, starch 64, salt mixture 4, butter 12, and marmite 2 parts. In the first method 22 gm. of the dry constituents in the above proportion, 10 cc. of a 5 per cent solution of marmite, 6.5 cc. of distilled water, and 3 gm. of melted butter were beaten together to form a stiff dough. In the second method the same amounts of the dry ingredients were mixed to a smooth paste with warm distilled water. The marmite solution and butter were then added and the whole well mixed, after which sufficient distilled water to make a total of 65 cc. was added and the mixture heated in a double boiler with constant stirring until it thickened, from 2½ to 3½ minutes being required.

In a comparative test of the two diets young rats fed the second or cooked diet grew more rapidly and were in better condition, as judged by appearance and post-mortem examination, than those on the raw diet.

Time of picking and the canning of prunes, H. Hartman (*Canning Age, 7 (1926), No. 5, pp. 424–426*).—This contribution from the Oregon Experiment Station deals with the effects of time of picking on the canning quality of Italian prunes as determined by the appearance, quality, size, and shrinkage of the prunes after canning and on the sirup and fruit cut-outs and acidity. The effect of storage until ripe before canning some of the lots picked when immature was also studied in the same way. The prunes were picked at intervals of 3 or 4 days from August 10 to September 12, inclusive, during which time the fruit passed from comparative immaturity to over-ripeness.

Fruit picked when fully mature but not over-ripe gave products on canning of the best appearance, texture, and flavor. The highest concentration of sirup and the lowest acidity were obtained from the late pickings. Contrary to expectation, the riper the fruit the greater the loss in weight on canning (or fruit cut-out) and the greater the shrinkage. The shrinkage was compensated somewhat by the larger size before canning of the more mature fruit.

Fruit picked when immature and stored at 66° F. until fully ripe gave excellent products on canning, thus demonstrating the possibility of shipping the fruit to eastern markets for canning purposes.

Cane juice clarification for table syrup, J. F. Brewster (*Louisiana Stas. Rpt. 1925, pp. 17, 18*).—On the basis of factory tests, various methods of clarifying cane juice for the preparation of table sirup are recommended. Open instead of vacuum evaporation is recommended as giving better results with any given method of clarification. Filtration with diatomaceous earth or with a limited amount of decolorizing carbon is considered feasible but expensive. It is said that clarification with phosphoric acid and lime can be accomplished at an increased cost of from ½ to 1 ct. per gallon. The method consists in increasing the acidity of the juice by from 1 to 1.5 cc. N/10 in a 10-cc. sample and liming back to approximately the natural acidity of the juice. Calcium carbonate in the form of precipitated chalk can be used in place of lime with the phosphoric acid or can even be used alone as a clarifying agent.

Sugar, G. Fairrie (*Liverpool: Fairrie & Co., 1925, pp. XIV+233, pls. 62, figs. 9*).—The various processes involved in the production of raw cane and beet sugar and unrefined direct consumption sugars, old-time and modern methods of sugar refining, the manufacture of sugars other than sucrose, and methods for the examination of raw sugar are described in simple nontechnical language. Statistics of the world crops of cane and beet sugar for the periods 1913–14, 1919–20, 1923–24, and 1924–25; the imports of raw and refined sugar into the United Kingdom for the years 1910 to 1924, inclusive; and the prices and consumption of refined sugar from 1800 to 1924, inclusive, are included. The volume is abundantly illustrated by photographs and diagrams.

Studies dealing with the lying of corn, E. S. Haber (*Canning Age, 7 (1926), No. 5, pp. 411–414, figs. 2*).—This investigation, which covered a period of several years, had for its original object a comparison of different varieties of corn for hominy purposes as judged by the readiness with which the pedicel of the kernel was removed, the swelling of the grain, and the color of the finished product when the usual commercial processes for the manufacture of hominy were followed. The procedure consisted in treating the corn with a 2 per cent solution of lye kept at the incipient boiling point, with constant stirring until the tips of the kernels could be brushed off easily; boiling with change of water for periods of 10, 10, 25, 35, and 70 minutes; boiling for 15 to 20 minutes in a solution of sodium bisulfite containing 1½ oz. to 1 lb. of the corn; boiling in three changes of water for 10 minutes each to remove the sodium bisulfite; and finally processing for 70 minutes at 242° F. in enameled or glass No. 2 cans.

Of the 12 varieties tested, those having broad kernels gave the best results, the first 3 being Hickory King, White Elephant, and Commercial White. The hominy from yellow corn and flint corn was unattractive in appearance but of good flavor. Sweet corn gave a soft, gummy, unsatisfactory product.

The scope of the work was then extended to determine with single varieties the effect of various factors on the quality of the product. Variations in the concentration of the lye were tested, with the conclusion that a 2 per cent solution is optimum. Attempts to can hominy without bleaching gave unsatisfactory results, the unbleached samples showing a much greater tendency to blacken in the can. A comparison of samples of corn of varying moisture content indicated a moisture content of from 10 to 15 per cent to be the most satisfactory. Less time was required for the removal of the lye from corn with a higher moisture content, but this was offset by the tendency of the kernels of high moisture content to break up more readily. Mixed corn, corn

of uneven size and shape, and old corn yielded unsatisfactory products. Incipient boiling rather than holding at 70° C. and mechanical agitation during boiling are recommended as hastening the process.

The commercial utilization of corncobs, O. R. SWEENEY (*Iowa Engin. Expt. Sta. Bul. 73 (1924), pp. 111, figs. 13*).—This is a compilation and review of investigations on corncob utilization, including in addition to those reported in scientific journals the results obtained in work done in the department of chemical engineering of the Iowa State College and Engineering Experiment Station and hitherto published chiefly in graduate theses. The subject matter is arranged under the heading analytical data on corncobs, furfural production, oxalic acid from corncobs, destructive distillation of corncobs, sugars, and fermentation products, the manufacture of synthetic plastics, and miscellaneous products. An annotated bibliography of 128 titles is appended.

METEOROLOGY

Report of the chief of the Weather Bureau, 1924–25 (*U. S. Dept. Agr., Weather Bur. Rpt. 1925, pp. III+264, pls. 7*).—This report gives a summary account of the meteorological service of the bureau in aid of aeronautics, discusses solar radiation and weather forecasting, and reviews the general weather conditions of 1924, with the usual detailed tabulations of meteorological data.

On the basis of an exhaustive study of all the observations available, the conclusion is reached that the reality of solar variations from day to day "has not been proved, and at best the effects of such changes, if any, are so vanishingly small when compared with those which we know to be due to the atmosphere as to be negligible from the point of view of our daily weather changes," and hence do not furnish an assured scientific basis for long-range forecasting.

Summaries of climatological data by sections, P. C. DAY ET AL. (*U. S. Dept. Agr., Weather Bur. Bul. W, 2. ed. (1926), vols. 1, pp. [646], pl. 1, figs. 34; 2 pp. [694], pl. 1, figs. 47; 3, pp. [727], pls. 13, figs. 47*).—This is a second edition (E. S. R., 29, p. 121) in three volumes of summaries giving for each section "a general survey of the topographic features of the section, a discussion of the climatic features based upon the previous weather records of the section, and full tables of the monthly and annual amounts of precipitation with averages for the period of observation, together with tables of snowfall, averages and extremes of temperature, averages of relative humidity, sunshine, winds, days with precipitation, details of excessive rainfalls, the dates of first and last killing frosts, length of growing season, and other weather phenomena. A chart showing the boundaries of the section, the location of the reporting stations, the drainage systems, and general elevation of the various portions above sea level accompanies each. Also the elevation of each reporting station above sea level is shown in the tables of monthly and annual precipitation."

Volume 1 covers the area from the Rocky Mountain States to the Pacific coast, including southern and western Texas; volume 2, the Great Plains States and eastward to Michigan, Indiana, and the lower Mississippi River, excepting southern and western Texas; and volume 3, the area from the lower Mississippi River, Kentucky, and Ohio eastward, and including Alaska and Hawaii.

[Weather reports from Alaska], C. C. GEORGESON ET AL. (*Alaska Stas. Rpt. 1924, pp. 1, 9, 18, 25, 38–47*).—Monthly summaries of temperature, precipitation, and cloudiness at 36 places in Alaska are given, with brief notes on the weather conditions at the experiment stations during 1924.

"At Sitka station . . . 49.25 in. of rain fell from April 1 to September 30, 1924, inclusive. During this period of 183 days there were only 34 clear days and the mean temperature was 50.9° F. . . . At Matanuska the last killing frost occurred May 13, and the first killing frost September 23, making a frost-free period of 133 days. The rainfall for the calendar year totaled 13.7 in. and for the frost-free period 8.02 in. Normally the rainfall averages about 14 in., and the snowfall between 3 and 4 ft. The snowfall of the winter was 20 in. . . . The early summer of 1924 was dry, and as a result all grain crops were slow in starting, while berry crops, particularly strawberries, suffered. . . . The snowfall of the winter of 1923–24 at Fairbanks was 23.97 in. The last killing frost occurred May 14 and the first killing frost August 14, giving a frost-free period of 92 days, which is 9 days less than for the 14-year average. . . . The weather was unfavorable at Rampart during the summer of 1924. Early in the summer a drought retarded vegetation and caused grain crops to be short in straw, and during the latter part of the season all crops suffered from excessive rain."

Climatic conditions, C. J. KING and A. R. LEDING (*U. S. Dept. Agr., Dept. Circ. 372 (1926), pp. 7, 8*).—Observations on temperature, precipitation, evaporation, and wind movement at the United States Field Station at Sacaton, Ariz., during the years 1922–1924, are summarized, and the seasonal conditions with reference to cotton and other crops are briefly discussed.

Annual report of the meteorological committee to the air council for the year ended March 31, 1925 (*[Gt. Brit.] Met. Com. Ann. Rpt., 1925, pp. 64; abs. in Nature [London], 116 (1925), No. 2927, p. 828*).—The part of this report of special interest to agriculture is that relating to the formation of a permanent committee on agricultural meteorology in connection with the Ministry of Agriculture of Great Britain, and the working out of a definite scheme for "the collection and coordination according to a fixed plan of meteorological, agricultural, and phenological data from a network of observing stations." It is stated that "very complete arrangements have been made by the Ministry of Agriculture for the collection of agricultural, horticultural, and phenological data" in form "for the investigation of the effects of varying meteorological conditions on agriculture."

Climatic pulsations during historic time in China, C. C. CHU (*Geogr. Rev., 16 (1926), No. 2, pp. 274–282*).—Data regarding droughts and floods, severe winters, and late frosts and snowfall, compiled from Chinese archives, are briefly discussed with reference to possible indications of periodic changes in climate during historic times. No very positive indications of such changes are developed.

A short summary of the final report of the Union Drought Investigation Commission (*Rhodesia Agr. Jour., 22 (1925), Nos. 7, pp. 770–773; 8, pp. 862–865; 23 (1926), No. 1, pp. 47–51*).—The Drought Investigation Commission, appointed by the Union of South Africa in 1920 to investigate and report upon drought conditions in South Africa, found no evidence that the average annual rainfall of the region is diminishing but that its effectiveness is constantly decreasing as a result of practices such as veld burning, unrestricted grazing, and denudation of forest and other growth, which increase evaporation, run-off, and erosion. Corrective measures are indicated.

The rôle of rainfall in the economic life of Palestine [trans. title], S. KRICHEWSKY (*Égypte Contemporaine, 17 (1926), No. 90, pp. 50–61*).—This article shows how the agricultural possibilities of Palestine are restricted because of the limited rainfall and its variable and uncertain distribution, and indicates various ways in which the water resources of the country can be conserved and used to better advantage.

The geographical distribution of plants in relation to climatic factors, E. J. SALISBURY (*Geogr. Jour., 67 (1926), No. 4, pp. 312–342, pls. 2, figs. 12; abs. in Nature [London], 117 (1926), No. 2944, p. 497*).—Numerous contributions to this subject as applied to Great Britain, western Europe, and the United States are reviewed.

It is stated that climate may delimit three zones in the distribution of a given plant, (1) a zone in which both abundant vegetative growth and reproduction are possible, (2) one in which normal vegetative growth ensues but reproduction is possible only in exceptional seasons, and (3) one in which the plant may be cultivated but will not reproduce. It is pointed out, therefore, that to be of real use plant distribution maps should also indicate the relative abundance in different areas of the species under consideration, and a plea is also made for detailed maps showing the actual rainfall, not corrected to mean sea level, and for maps showing the seasonal distribution of rainfall.

Meteorological factors and the formation of sugar in sugar beets [trans. title], J. DE VILMORIN and E. CAZAUBON (*Bul. Assoc. Chim. Sucr. et Distill., 43 (1925), No. 5, pp. 159–166, figs. 4*).—From observations made during 1922–1925 the conclusion is drawn that the first three months of growth are the most influential in determining the yield of roots and sugar, the weather of the month of August furnishing the most reliable basis for predicting the yield of roots and leaves and the sugar content of the roots. It is proposed by frequent weighings and analyses to determine more definitely the behavior of the plant under varying meterological conditions.

SOILS—FERTILIZERS

Soil survey of Jenkins County, Georgia, E. D. FOWLER and J. M. SNYDER (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1923, pp. III+91–122, fig. 1, map 1*).—This survey, made in cooperation with the Georgia State College of Agriculture, deals with the soils of an area of 225,280 acres in east-central Georgia. The topography is gently undulating to rolling. Most of the county is well drained, but a considerable acreage of poorly drained soils and swamp land occurs along all the larger streams and extends up their tributaries. Poorly drained sinks and depressions occur scatteringly in the northwestern part.

The representative soils of the county are characterized by light colored very sandy surface soils. The soils of the poorly drained parts have a sandy surface soil and grade downward to heavier material. Including swamp, 14 soil types of 9 series are mapped, of which the Ruston, Grady, and Norfolk sandy loams and swamp cover 28.2, 15.7, 14.1, and 12.5 per cent of the area, respectively.

Soil survey of Iowa.—Reports 40, 41, W. H. STEVENSON, P. E. BROWN, ET AL. (*Iowa Sta. Soil Survey Rpts. 40 (1926), pp. 62, pls. 2, figs. 14; 41, pp. 56, pl. 1, figs. 9*).—Two county soil surveys are presented, which include analyses and greenhouse and field experiments to determine the composition, fertilizer requirements, and crop adaptations of the prevailing soil types, and information on methods of conducting soil surveys in Iowa.

No. 40, Woodbury County soils.—This is an area of 561,280 acres lying entirely in the Missouri loess soil area in western Iowa. Three distinct topographic divisions exist, namely, the upland plains, the bluffs along the rivers, and the bottomland plains. It is stated that the drainage in general is good except on the bottomland where it is frequently inadequate.

The soils are grouped as drift, loess, terrace, and swamp and bottomland soils, the loess soils covering 61 per cent and the swamp and bottomland

27.7 per cent of the area, respectively. Including alluvial soils, 18 soil types of 10 series are mapped, of which the Marshall silt loam loess soil covers 58.4 per cent of the area. It is stated that lime is needed on many of the soils of the county, and that many of the soil types are not very well supplied with organic matter. The phosphorus content is also rather low in most of the soils.

No. 41, Page County soils.—This is an area of 339,840 acres lying entirely in the Missouri loess soil area in southwestern Iowa. The topography is as a whole gently to smoothly rolling. The drainage is said to be mostly adequate.

The soils of the area are grouped as drift, loess, terrace, and swamp and bottomland soils. The loess soils cover 60.5 and the swamp and bottomland soils 19.8 per cent of the area, respectively. Including riverwash, 9 soil types of 6 series are mapped, of which the Marshall silt loam loess soil, the Wabash silt loam swamp and bottomland soils, and the Shelby silt loam drift soil cover 60.5, 16.9, and 16.8 per cent of the area, respectively.

The phosphorus supply in the soils of the area is not large in any case. It is considered apparent that all of the soils of the county need lime.

Soil survey of the Trenton area, New Jersey, L. L. Lee et al. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1921, pp. IV+1575–1632, pl. 1, fig. 1, map 1*).—This survey, made in cooperation with the Department of Conservation and Development of New Jersey, deals with the soils of an area of 508,160 acres comprising about three-fourths of Mercer County, one-half of Middlesex County, about one-fourth of Burlington and Monmouth Counties, and one-sixth of Ocean and Somerset Counties in west-central New Jersey. The topography ranges from level to hilly. The area embraces parts of the Piedmont Plateau and the Atlantic Coastal Plain, and as a whole is said to be well drained.

The soils of the area are partly residual and partly transported, about four-fifths of the area being occupied by the latter. Including meadow, swamp, tidal marsh, muck, and clay pits, 55 soil types of 22 series are mapped, of which the Sassafras loam covers 14.2 per cent of the area. Chemical analyses of certain of the prevailing soil types are included.

Soil survey of Sampson County, North Carolina, R. C. Jurney et al. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1923, pp. III+57–89, fig. 1, map 1*).—This survey, made in cooperation with the North Carolina Department of Agriculture and Experiment Station, deals with the soils of an area of 608,000 acres in southeastern North Carolina. The topography is prevailingly gently rolling, although many flat areas occur. The drainage is complete over a large part of the county, but there are considerable swampy areas along the streams and other low lying sections in which the drainage is very poor.

The county lies entirely in the Coastal Plain province, and most of the soils have been formed directly from the underlying material. Including swamp 28 soil types of 15 series are mapped, of which the Norfolk sand covers 20.3 per cent of the area.

Soil survey of Clackamas County, Oregon, A. E. Kocher et al. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1921, pp. III+1633–1701, pls. 3, fig. 1, map 1*).—This survey, made in cooperation with the Oregon Experiment Station, deals with the soils of an area of 623,360 acres in northwestern Oregon. About four-fifths of the area is upland, which is about equally divided between nonagricultural mountainous land and rolling hills suitable for cultivation. Except in a few areas in the valleys, drainage is fairly well established.

The soils of the area are grouped as residual, old valley filling, and recent alluvial soils. Including rough broken and stony land, rough mountainous

land, riverwash, and muck and peat, 33 soil types of 21 series are mapped, of which rough broken and stony land, Olympic silt loam, rough mountainous land, and Olympic clay loam cover 14.1, 13.3, 11.9, and 11.6 per cent of the area, respectively.

Some characters of Scottish soils, J. HENDRICK (*Highland and Agr. Soc. Scot. Trans., 5 ser., 37 (1925), pp. 71–85*).—In a contribution from the University of Aberdeen, data on the mechanical and chemical composition of Scottish soils are summarized which indicate that the soils over wide areas in Scotland are thin and light but are surprisingly fertile. They are often somewhat acid and contain no appreciable supply of calcium carbonate, yet they are able to go for long periods without lime. It is concluded that the great reserves of phosphoric acid, potash, lime, magnesia, and soda, which are present in the form of slightly weathered minerals in these soils, do much to account for the surprising fertility of what appear to be poor, light, thin soils. In addition the great reserves of bases contained in the undecomposed silicates of these soils enable them, in the abence of liming, to produce gradually a supply of lime and other bases sufficient to stave off almost indefinitely the evil effects of extreme lime deficiency.

Determination of grit in clays, G. M. DARBY (*Chem. and Metall. Engin., 32 (1925), No. 14, pp. 688–690, figs. 2*).—A comparison of centrifugal, flotation, elutriation, and screening methods for classifying fine suspensions is reported, from which the opinion is expressed that wet screening using standard 100-, 200-, and 325-mesh sieves offers the best procedure for the sizing and determination of coarse grit in clays.

Chemical investigation of weathering phenomena in Buntsandstein, especially on the nature of solutions in such stones and their separates [trans. title], E. BLANCK and W. GEILMANN (*Tharandter Forstl. Jahrb., 75 (1924), No. 3, pp. 89–112*).—A detailed chemical study conducted at the University of Göttingen is reported from which the conclusion is drawn that the exact composition of the solutions circulating in sandstone rocks and their separates is indeterminate. It is believed, however, that they are primarily sulfate solutions, and that the sulfur part thereof is derived from organic plant materials. The ammonia, nitric acid, and phosphoric acid contents are also thought to originate from the same source.

It is considered that the sulfuric acid originating in this manner has a greater part in weathering phenomena than the weaker humus acids.

Impermeability of soils (*New Mexico Sta. Rpt. 1925, pp. 13–16*).—A continuation of studies of the influence of various constituents of alkali on the permeability of soils (E. S. R., 53, p. 114) showed that sodium compounds have a very marked effect in decreasing the permeability. In the order of decreasing effect the compounds tested were sodium carbonate, sodium chloride, sodium nitrate, sodium silicate, and sodium sulfate. The same salts of potassium followed the same order, but had comparatively little effect on permeability. Acid phosphate, ammonium sulfate, and sulfur improved the permeability somewhat. Ammonium sulfate is therefore considered preferable to sodium nitrate as a nitrogenous fertilizer.

Aluminum sulfate was found to be the most effective substance in improving the permeability of heavy soils. The best results were obtained by mixing the dry sulfate with the soil. Cultivation was also found to have a beneficial effect on permeability. Substances decreasing permeability did not increase the alkalinity of the first percolate, but on continued percolation the alkalinity rose until it was higher than that of the original soil.

Analyses of the soils after percolation indicated a slight lowering of the alkalinity for those substances increasing the alkalinity. Iron and aluminum

were not present in the percolates from soil tubes to which 0.5 per cent of these elements had been added as sulfates, but these elements displaced calcium, magnesium, and a little potassium. Higer concentrations of aluminum sulfate evolved carbon dioxide in very considerable amounts.

[Treatment of alkali soils with aluminum sulphate at the U. S. Field Station, Sacaton, Ariz.], C. J. KING and A. R. LEDING (*U. S. Dept. Agr., Dept. Circ. 372 (1926), pp. 10, 11*).—Experiments are briefly reported, the results of which indicate that the application of aluminum sulfate in sufficient quantities to so-called slick spots in soils materially increases their permeability and friability.

Plant injury on acid soils [trans. title], A. SCHUCKENBERG (*Ztschr. Pflanzenernähr. u. Düngung, 3 (1924), No 2, Wiss., pp. 65–90, pls. 4*).—Studies on the influence of different forms of soil acidity and of various degrees thereof on plant growth under different fertilizer treatments are reported, the purpose being to establish the cause of injury.

Pot experiments with barley on two acid loam soils and an acid humus sand soil showed that the exchange acidity of the sand soil was not removed by liming or by physiologically alkaline fertilization, but that it was completely neutralized in the two loam soils. The hydrolytic acidity was markedly reduced by liming and physiologically alkaline fertilization, but was not completely removed. It did not injure the barley.

A comparison of the influences of an acid and a neutral soil of similar history on plant growth showed that liming of the acid soil markedly increased the yield, the soil being of a strongly exchangeable nature. Physiologically acid fertilization prevented crop growth on the acid soil, but simultaneous liming made such fertilization favorably effective.

Studies on the influence of soil acidity on germination of four grain crops showed that the germination of rye and barley was not affected, but that of wheat was reduced 10 per cent and of oats 50 per cent. The forms of acidity in humus were injurious to the development of barley and rye. This influence was increased by the addition of neutral salts and was reduced by liming.

It is concluded that so-called active acidity is of no significance in arable soils. The extremely injurious action of humus acids is not explained. The injurious action of exchange acidity is attributed to the formation of soluble aluminum salts through exchange of ions. Hydrolytic acidity was not injurious to the four grain crops.

Nitrate-forming bacteria, II [trans. title], J. SACK (*Centbl. Bakt. [etc.], 2. Abt., 64 (1925), No. 1–7, pp. 37–39*).—In a second contribution to the subject (E. S. R., 54, p. 216), further studies are reported on the properties of four nitrate-forming bacteria. *Nitrobacter flavus* was the one organism tested which was capable of oxidizing ammonia to nitrite and nitrate.

Nitrite-forming bacteria [trans. title], J. SACK (*Centbl. Bakt. [etc.], 2. Abt., 64 (1925), No. 1–7, pp. 32–37*).—Studies are reported in which one and the same nitrite-forming bacterium was found in six different soil types in Groningen Province. This organism was named *Nitrosomonas groningensis*. It grows on the ordinarily used culture media and forms nitrite from ammonia. It attacks cellulose and forms albumin, casein, fibrin, and peptone ammonia out of egg white. This organism reduces nitrate to nitrite under anaerobic conditions. It can utilize sources of carbon other than free carbon dioxide.

Critical discussion of the inoculation of nonlegumes [trans. title], H. KOERNER (*Ztschr. Pflanzenernähr. u. Düngung, 4 (1925), No. 9, Wirtschaft.-Prakt., pp. 382–394*).—A critical summary of work by others on the inoculation of nonlegumes with nodule organisms is presented, which throws considerable doubt on the possibility of this process.

Bacterial sulfur oxidation in pond soils and its practical significance [trans. title], H. FISCHER (*Centbl. Bakt.* [*etc.*], *2. Abt.*, *65* (*1925*), *No. 1–5*, *pp. 35–42*).—Studies are reported which showed that sulfate formation in pond soils proceeds similarly to nitrification. Autotrophic microorganisms, the activity of which is favored by alkalinity in the soil and water, are considered to be the active agencies in this respect.

It is thought that the sulfates so formed are active in making the soil phosphates available for fish. In this connection the results of experiments on the fertilization of ponds with ammonium sulfate, kainit, and kieserite are attributed to the action of the sulfate ions of these materials on the soil phosphates.

Factors affecting the productivity of western Canadian soils, F. A. WYATT (*Sci. Agr.*, *6* (*1925*), *No. 3*, *pp. 69–88*, *figs. 6*).—In a contribution from the University of Alberta data are reported on lithological, drainage, climatic, and other factors affecting the productivity of western Canadian soils.

The data indicate that in general these soils are well supplied with nitrogen and organic matter, this being their most striking characteristic. Under the prevailing climatic conditions most of these soils exhibit a rapid rate of decomposition of the organic matter as indicated by the production of nitrates. These soils are also generally well supplied with the mineral plant nutrients, and in no case are they deficient in potassium or calcium. Generally they contain an abundant supply of phosphorus except in certain restricted districts.

It is concluded that the climatic factors have exerted more influence upon the present productive power of the various soil types considered than have the lithological or weathering agencies, since the climate has been largely responsible for the nitrogen and organic matter content of the various soils.

Some sphagnum bogs of the North Pacific coast of America, G. B. RIGGS (*Ecology*, *6* (*1925*), *No. 3*, *pp. 260–278*, *pl. 1*).—Studies by the University of Washington of 78 bogs from Coos Bay, Oreg., to the Shumagin Islands in Alaska are reported. The term sphagnum bog is defined as that stage in the physiographic succession of an area during which its surface is entirely devoid of ordinary hard soil, and is made up almost entirely of living Sphagnum immediately under which is fibrous brown peat composed mainly or entirely of partially distintegrated Sphagnum.

It was found that the two plants in addition to Sphagnum that are most characteristic of the sphagnum bogs of the whole region are *Oxycoccus oxycoccus* and *Drosera rotundifolia*. The bogs examined varied in depth from 1 to more than 31 ft. Some of them were found to rest on glacial till and others on sand, blue clay, gravel, soil formed in place, and rock. The present bog stage is in most cases clearly a succession on either lakes or swamps, although in some cases it may possibly be a succession on forests. Physiological conditions in bogs were found to be different from those in other habitats.

Are the so-called acid fertilizers alone to blame for unfavorable changes of soil reaction? [trans. title] H. NIKLAS and F. VOGEL (*Ztschr. Pflanzenernähr. u. Düngung*, *4* (*1925*), *No. 9*, *Wirtschaft.-Prakt.*, *pp. 375–381*, *fig. 1*).—Data are reported which indicate that unfavorable changes of soil reaction are the results of a number of factors, of which fertilization with physiologically acid fertilizers is only one of secondary importance.

Better utilization of soil phosphoric acid [trans. title], J. WITYN (*Ztschr. Pflanzenernähr. u. Düngung*, *6* (*1925*), *No. 1*, *Wiss.*, *pp. 27–51*).—Studies are reported which showed that the soil reaction has a marked influence on the kind of phosphoric acid compounds in soil. Tricalcium phosphate prevails in neutral and weakly alkaline soils, while in acid soils are found the compounds of phosphoric acid with organic matter and iron and aluminum oxides.

Transformations of the phosphoric acid compounds occur apparently in accordance with variations in the soil reaction. Liming of strongly acids soils was found to increase the availability of the soil phosphoric acid to plants.

Greater quantities of phosphoric acid were generally found in acid soils than in neutral fertile soils. This was especially true in those strata deficient in lime.

Crops were found to suffer less from phosphoric acid deficiency in neutral arable soils which were once acid than in acid soils. Acid lowland moor and meadow soils were found to be especially rich in phosphoric acid. It was possible to increase the availability of this phosphoric acid by methods which will produce a neutral but not an alkaline reaction. Gypsum was of value in this connection.

Investigation of the Aereboe-Wrangell system [trans. title], O. Nolte (*Mitt. Deut. Landw. Gesell., 39 (1924), No. 49, pp. 862–869*).—Studies to determine the extent to which increasing applications of physiologically acid ammonia and potash fertilizers will increase crop yields by increasing the availability of the soil phosphoric acid are reported.

The results indicated that the acid residue made available by such treatment had little to do with the increased utilization of soil phosphoric acid by crops. On the other hand, it was found that the greater plant development and increased root activity of grain crops resulting from increased nitrogen fertilization were sufficient to account for the greater utilization of soil phosphoric acid and increased yields.

Three year compost rotation experiment [at the North Louisiana Station], S. Stewart (*Louisiana Stas. Rpt. 1925, p. 40*).—Data from this experiment (E. S. R., 53, p. 514) are tabulated.

Importance of nitrogen fertilization in increasing the yield of important crops [trans. title], O. Nolte and R. Leonhards (*Mitt. Deut. Landw. Gesell., 40 (1925), Nos. 24, pp. 462–466; 25, pp. 484–490*).—Data on the use of nitrogenous fertilizers in German agriculture since 1911 are summarized. These show that less nitrogenous fertilizer has been used on German food crops since the war than during the years preceding it. Experiments conducted during the years following the war have shown that the heaviest applications of nitrogen have produced profitable increases in crop yield.

Fertilization experiments with nitrogen on meadow [trans. title], A. Alves and O. Nolte (*Mitt. Deut. Landw. Gesell., 40 (1925), No. 47, pp. 904–908*).—Data from meadow fertilization experiments with ammonium sulfate and lime nitrogen are reported and briefly discussed (E. S. R., 52, p. 723). These indicate the best utilization of nitrogen from the smaller and medium applications. Lime nitrogen gave the best results when applied before growth began, but later applications of ammonium sulfate were preferable.

Sources of ammonia, J. J. Skinner and T. S. Buie (*South Carolina Sta. Bul. 227 (1926), pp. 32, figs. 7*).—The first part of this bulletin reports the results of experiments with various nitrogen salts derived from the air and organic materials containing nitrogen which were conducted in cooperation with the U. S. D. A. Bureau of Plant Industry.

In all the cotton experiments the air-derived nitrogen salts were found to compare favorably with sodium nitrate and ammonium sulfate. An average of all the yields showed that ammonium chloride produced a slightly smaller average yield, ammonium nitrate a slightly larger average yield, and ammonium phosphate about the same yield as sodium nitrate and ammonium sulfate. Good results were secured with the air-derived nitrogen salts on corn.

The second part reports experiments with cyanamide on cotton. The results showed that the effect of cyanamide in mixtures of acid phosphate and potash

was to reduce the yield of cotton and of corn when used in a sufficiently large quantity to serve as the sole source of nitrogen for these crops. When used in small quantities in such mixtures and as a part of the nitrogen together with other nitrogen materials, good results were secured and no harmful effects were noted. In experiments in which basic phosphate was used as the source of phosphorus in a mixed fertilizer, cyanamide gave as good yields with corn in most instances as did other fertilizers.

The third part reports experiments with commonly used nitrogen materials. The results as a whole showed that there was not a wide variation in yield as produced by the various nitrogen materials. The fertilizers in which one-half of the ammonia was derived from an organic material and one-half from sodium nitrate or ammonium sulfate gave a larger average yield by 9 or 10 per cent than did fertilizers having all the nitrogen derived from either sodium nitrate or ammonium sulfate alone. A mixture of two-thirds sodium nitrate and one-third ammonium sulfate gave practically as good yields as where one-half the ammonia was secured from an organic source. The average results showed that sodium nitrate gave a slightly larger yield than ammonium sulfate in mixed fertilizers.

Other general experiments with fertilizers are summarized.

Varying volume weight of ammonium sulfate [trans. title], C. H. van Harreveld-Lako (*Arch. Suikerindus. Nederland. Indië, 33 (1925), No. 23, pp. 486–489*).—Data are briefly reported showing that the coefficient of volume weight of ammonium sulfate from different methods of manufacture will vary from 0.64 to 1.04.

The Rehmsdorf nitrogenous fertilizer [trans. title], P. Roviera (*Staz. Sper. Agr. Ital., 57 (1924), No. 1–3, pp. 77–81, figs. 5*).—Brief studies of a nitrogenous fertilizer said to be composed of animal waste rendered soluble by a special process are reported.

This material was found to contain 25.66 per cent of water-insoluble material and 66.11 per cent of water-soluble material. The water-insoluble portion contained 3.5 per cent of organic nitrogen, and the water-soluble portion contained 0.16 per cent of ammoniacal nitrogen, 2.52 per cent of organic nitrogen, and traces of nitric acid.

A comparison of this fertilizer with dried blood by means of pot experiments with wheat showed that it decomposes readily but considerably less rapidly than dried blood. Its fertilizing action is proportionately less rapid.

Influence of increasing phosphoric acid additions on the yield of important crops [trans. title], O. Nolte and R. Leonhards (*Mitt. Deut. Land. Gesell., 40 (1925), No. 31, pp. 557–560*).—Experiments on the use of superphosphate, Thomas meal, and Rhenania phosphate on grain and root crops are reported.

The results with grain crops showed that the action of the different phosphatic fertilizers under similar conditions varied widely and was in no case dependent solely on the phosphoric acid content. The average of all experiments indicated that the use of phosphatic fertilizers was profitable. However, the average results were found to have no practical significance with reference to the amounts of these fertilizers to use.

The experiments with root crops apparently did not yield such profitable results. Small applications of phosphatic fertilizers gave no increases, and the gains secured from large fertilizer applications were in some cases not profitable. The average results indicated profitable increases from the use of Thomas meal and Rhenania phosphate approximately equal in value to the difference between the prices of these fertilizers and that of superphosphate.

The results are taken to indicate that the number of German soils which will react to phosphoric acid fertilization is increasing.

On the stimulating effect of phosphatic fertilizers on azofication in South Australian soils, H. K. Lewcock (*Aust. Jour. Expt. Biol. and Med. Sci., 2 (1925), No. 2, pp. 127–133, fig. 1*).—Studies conducted at the University of Adelaide, South Australia, on the effect of phosphates on nitrogen fixation by Azotobacter in some South Australian soil types are reported.

The conclusion is drawn that the addition to such soils of commonly used soluble phosphatic compounds may result in a pronounced stimulation of the natural nitrogen fixation processes. It is suggested also that the lack of available phosphoric acid is a limiting factor for the growth of Azotobacter in many South Australian soils, and that the increased nitrogen fixation brought about by the application of phosphatic fertilizers may explain the general ineffectiveness of nitrogenous fertilizers in local agricultural practices.

Potash from greensand (glauconite), J. W. Turrentine, C. W. Whittaker, and E. J. Fox (*Indus. and Engin. Chem., 17 (1925), No. 11, pp. 1177–1181*).—In a contribution from the U. S. D. A. Bureau of Soils a new process is described for the extraction of potash from greensand, in which practically all of the constituents of the greensand are converted into useful products by simple and economical procedures.

Calcareous fertilizers, A. Matthei (*Fertilizantes Calcáreos. Santiago, Chile: Impr. Univ., 1925, pp. 111*).—This report presents a scientific demonstration of important factors involved in the agricultural use of lime on the basis of studies conducted over a period of three years. These dealt with the physico-chemical and biochemical influences of lime on soil, and included practical and comparative tests and demonstrations of the use of lime on different soils and crops.

Liming was found to increase the yield and quality of crops in most Chilean soils by aiding their nutrition and facilitating the germination of seed. It also aided in the decomposition of soil organic matter, neutralized injurious soil acidity, and acted as an insecticide. Liming retarded the impoverishment of the surface soil in available phosphoric acid, and increased the availability of the potash content of the subsoil for plant roots. It also favorably influenced the physical condition of heavy plastic soils.

Tabular data are included.

Agricultural liming materials (*Md. Univ. Quart. No. 114 (1925), pp. 18*).—Guaranties and actual analyses of 103 samples of liming materials collected for inspection in Maryland during the period from November 1, 1924, to November 1, 1925, are presented.

Mineral resources of the United States, 1922.—II, Nonmetals, F. J. Katz et al. (*U. S. Geol. Survey, Min. Resources U. S., 1922, pt. 2, pp. V+804, pls. 6, figs. 64*).—This report contains special sections on Peat, and Asphalt and Related Bitumens, both by K. W. Cottrell; Nitrates, by G. R. Mansfield; Magnesium and Its Compounds, by J. M. Hill and G. F. Loughlin; Clay, by J. Middleton; Potash, and Phosphate Rock (E. S. R., 51, p. 518), both by G. R. Mansfield; Gypsum, by K. W. Cottrell (E. S. R., 51, p. 518); Sulphur and Pyrites, by H. A. C. Jenison and H. M. Meyer; and Lime, by G. F. Loughlin and A. T. Coons (E. S. R., 50, p. 724).

Fertilizers: Some new factors in domestic fertilizer production and trade, H. A. Curtis (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Trade Inform. Bul. 372 (1925), pp. II+23*).—The purpose of this bulletin is to point out new features and factors which have entered into the fertilizer situation in the United States since 1914. It contains sections on fertilizer production in the United States, United States imports and exports of fertilizers, the American position in the Chilean nitrate industry, nitrogen from coal carbonization, synthetic ammonia, and new forms of phosphate fertilizer.

Fertilizer report, 1924, J. W. Kellogg (*Penn. Dept. Agr. Bul. 402 (1925), pp. 151*).—This report contains the text of the amended fertilizer law of Pennsylvania, a list of fertilizer registrations for 1925, and guaranties and actual analyses of 1,869 samples of fertilizers and fertilizer materials collected for inspection in the State during 1924.

AGRICULTURAL BOTANY

Factors governing the initiation of sprout growth in citrus shoots, F. F. Halma (*Hilgardia* [*California Sta.*], *1 (1926), No. 14, pp. 295–340 figs. 11*).—A report is given of an investigation of the regeneration of vertical and horizontal Eureka lemon shoots and Chinese lemon cuttings, the former being studied in the field and the latter under controlled conditions in the laboratory.

As a result of his experiments, the author found that when a vertical lemon shoot is cut back to the mature wood, sprouts are produced only from the uppermost buds, and the length of the sprouts decreases from the apex downward. On vertical shoots, buds normally dormant can be released from dormancy by various mechanical means such as notching or girdling above a bud or by tightly wrapping tape around the upper portion of the shoot. The amount of sprout growth produced was found to be in proportion to the size of the shoot or cutting. The temporary wrapping of the upper portion of a cutting was found to divide it into two physiological units, each of which produces sprout growth in proportion to the size of the piece. There was nothing found to indicate that the sprouts on one portion inhibit the growth of sprouts on the other.

It is claimed that dormant mature shoots or cuttings contain stored food reserves in proportion to the size of the piece. With proper temperature and moisture conditions these reserves are transformed into growth-promoting substances. This transformation, it is claimed, will account for the initial condition of sprout growth, but apical dominance during the later growth period is believed to be due to an inhibitory substance produced by the growing shoots. Injecting various chemical compounds into dormant Chinese lemon and Ligustrum cuttings did not affect apical dominance, nor did any of the substances increase the normal amount of sprout growth.

Horizontal lemon shoots or Chinese lemon cuttings are said to produce sprouts on the dorsal side only, but by bending a horizontal shoot in the opposite direction a new set of sprouts may be produced from buds which would otherwise remain dormant. By this method the total number of sprouts can be practically doubled, while the total amount of growth produced is approximately the same as that produced by shoots which remained in the original horizontal position. Notching above a bud on the ventral side results in sprout growth from that bud. Notching below a bud, either on the dorsal or ventral side, is ineffective. No growth was found to take place on the ventral side when the buds on the dorsal side were burned out, but sprouts appeared from adventitious buds on the dorsal side. Preventing sprout growth on the dorsal side does not cause growth on the ventral side.

Compression or tension caused by bending shoots had no effect on the distribution of sprouts during the initial period, nor were any differences found in the physical properties of the sap of the dorsal and ventral side of sprouts at the beginning of the growing season. The relative catalase activity is said to be slightly higher on the dorsal side of younger shoots. As they become older a greater difference exists, but the order is reversed.

Duplication of generative nuclei by means of physiological stimuli and its significance, W. E. de Mol (*Genetica [The Hague], 5 (1923), No. 3-4, pp. 225-272, pls. 6, figs. 3*).—It is stated that, both in single and in double flowers and in diploid and in heteroploid varieties of *Hyacinthus orientalis*, abnormal but presumably functional pollen grains can be produced by means of physiological stimuli. These pollen grains are large and globular, the normal grains being smaller and ellipsoidal. Besides these, another abnormal kind may always be found, having from two to eight globular nuclei, these grains being presumably haploid. "The obtention, in the experimental way, of sexual nuclei, having exactly twice the volume of normal sexual nuclei or the number of which has approximately been doubled, can be called duplication of sexual nuclei. This duplication probably takes place after normal heterotype and homotype division." Varietal differences in susceptibility are noted. Triploid seedlings are supposed to originate by duplication of male sexual nuclei. It is thought that certain gigantic narcissus forms have originated in a manner comparable to that above indicated. The question is raised whether the origination of pluriploid forms among the Oenotheras may not be related to the duplication of sexual nuclei by means of physiological stimuli.

Certain water relations of the genus Prunus, A. H. Hendrickson (*Hilgardia [California Sta.], 1 (1926), No. 19, pp. 479-524, figs. 19*).—The results are given of a comparative study of stomatal behavior and moisture content of trees of the genus Prunus during the rainless summer months in California, where they are grown under conditions of both abundant and scanty soil moisture.

The stomata of peach, prune, and apricot trees were found to reach their maximum degree of opening between 9 a. m. and 12 o'clock noon, after which they began to close. The greatest closure of stomata in prune and apricot trees was observed between 8 and 11 p. m. Peach, prune, and apricot trees growing under conditions of little or no available soil moisture showed a smaller maximum stomatal opening than trees growing in soil containing an abundance of available moisture. Leaves at the apex of vigorous current season's shoots of prune trees growing in moist soil showed less stomatal opening than older leaves farther back on the branch. On prune trees which were suffering for water, all leaves on various parts of the tree showed approximately the same small degree of opening. Stomata on shaded peach trees in moist soil did not reach the maximum degree of opening until several hours after those of trees in moist soil under open orchard conditions.

The decrease in moisture content which was observed on the leaves of peach trees shortly after 6 a. m. is said to have been propagated backward rapidly and may be detected in all parts of the tree as early as 9 a. m. This loss of moisture is partly replenished between 3 and 6 p. m. A decrease in moisture content of various tissues of peach trees was observed in many cases before the stomata had reached their maximum opening, and replacement of this loss began in the afternoon while the stomata were still open and while climatic conditions were still favorable for transpiration.

Soil humidity and insolation as related to development and seed alkaloid content of lupine [trans. title], H. Malarski and J. Stpniewski (*Pam. Państ. Inst. Nauk. Gosp. Wiejsk. Pulawach (Mém. Inst. Natl. Polon. Écon. Rurale Pulawy), 4 (1923), A, No. 4, pp. 302-327, fig. 1*).—The methodology and data here detailed refer chiefly to *Lupinus angustifolius coeruleus*.

Utilization of solar energy by field crops [trans. title], A. G. Doíarenko (Dojarenko) (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 1 (1924), No. 1, pp. 7-21, figs. 3*).—The present article gives in detail and in tabular form the

results of a study during four years of a number of important crops as regards their respective utilization of solar energy.

Botanical studies on death from heat and metabolic poisons [trans. title], H. ILLERT (*Bot. Arch.*, *7* (*1924*), *No. 1–2, pp. 133–141*).—The supramaximal temperature endurance of *Oxalis acetosella* is conditioned and influenced by various factors. It is elevated by deprivation of light and of nutrition but lowered by poisons.

Further observations on the relations between growth and sap concentration in citrus trees, H. S. REED and F. F. HALMA (*Jour. Agr. Research* [*U. S.*], *32* (*1926*), *No. 12, pp. 1177–1194, figs. 10*).—In continuation of studies on the correlation between sap concentration and the effects of pruning, which have been reported previously (E. S. R., 45, p. 124), the authors report that the seasonal fluctuation in the sap concentration of citrus trees bears a certain inverse proportionality to their rate of growth, the highest concentration having been found during periods of more or less complete dormancy and the lowest during periods of active vegetative growth. There is said to exist a certain correspondence between the evaporating power of the air and the water deficit of lemon twigs, although the variations of the latter usually lagged somewhat behind the former.

The concentration of sap obtained from fruit wood of citrus trees was found to be generally higher than that from shoot wood of similar age. Blossoms are said to have appeared on the lemon trees at periods which corresponded fairly well with the time at which the sap concentration of the fruit wood reached a maximum. The sap concentration of the lemon trees was found to show some depression as a result of severe pruning, but usually this effect was transient. Determinations of the sap concentration of thrifty and of unthrifty orange trees are said to have shown rather significant differences. While the fruit was setting, the thrifty trees had a higher sap concentration, but as the summer passed the unthrifty trees suffered from scanty irrigation and other untoward cultural conditions, with the result that their growth was retarded and the sap concentration was raised. The thrifty trees suffered much less from June drop than unthrifty ones. The H-ion concentration of the sap of both lemon and orange trees was found to show a rather small amount of seasonal fluctuation. During the period of rapid vegetative growth, when presumably carbohydrates were being extensively oxidized, there was some increase in acidity.

Effect of nutrient conditions on colloidal properties of certain vegetable crops, J. W. CRIST (*Michigan Sta. Tech. Bul. 74* (*1926*), *pp. 27, figs. 4*).—As a contribution to the knowledge of nutrition of plants the author gives the results of experiments with a number of vegetable crops in which the effect of various fertilizers on plant tissue and tissue content is shown. It is claimed that all plants grown on soils which had their deficiencies in plant nutrients corrected by applications of fertilizer substances had a greater total water content, more water per gram of dry weight and consequently a higher ratio of green to dry weight, and a lower water requirement. The fresh tissue also became dehydrated less rapidly than that of the check plants.

Determinations made by the method of Newton and Gortner (E. S. R., 51, p. 26) are said to show that the treated plants had higher percentages of bound water, and the hydratable components of their juices were of greater hydration capacity. Nitrates were found the most effective in increasing bound water and hydration capacity. Potassium and phosphorus, especially the former, when used with the nitrate, decreased bound water and hydration capacity below that which obtained when the same quantities of the nitrate alone were

applied. Raw sulfur used with the nitrate on tomato plants did not reduce its efficiency as did the potassium and phosphorus. The author claims that the lack of close, consistent correlation between the effects of the individual nutrient substances on the bound water and hydration capacity on the one hand and on the other the water content, water requirement, and rate of dehydration of the same plants indicates that other factors besides capacity for imbibing and binding water are of great importance in influencing certain features of the plant's structure and behavior.

Colloidal gels made to simulate the normal plant tissue did not conform at all closely to the behavior of the tissue in dehydration.

Acidity of nutritive solutions and chlorosis [trans. title], M. K. Domontovich (Domontowitsch) (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.) 1 (1924), No. 3, pp. 191–199*).—*Studies during the summer on water cultures of maize* showed, it is stated, a high degree of chlorosis in KH_2PO_4 and $FePO_4$ or $Fe_3(PO_4)_2$ if the pH of the medium exceeded 5.3–5.5, although all leaves remained green at pH less than 5. The behavior of maize under other cultural conditions is detailed.

Potassium uptake in young rye plants rooted in small soil volumes [trans. title], M. Eschenhagen (*Bot. Arch., 7 (1924), No. 5–6, pp. 418–448*).—In a bibliographical and circumstantial account, potassium uptake and development are considered in connection with the influence of various other growth factors.

The relation of plants to ammonium carbonate [trans. title], D. N. Prianishnikov (Prjanischnikow) (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 1 (1924), No. 3, pp. 179–190, fig. 1*).—Having repeated work, not specifically *cited, of authors named, with precautions to avoid the alkaline reaction of* ordinary (commercial) ammonium carbonate by employing means to obtain the bicarbonate as a source of nitrogen for lupines and other seedlings, the author obtained favorable results as regards development.

The physiological characteristic of ammonium nitrate [trans. title], D. N. Prianishnikov (Prjanischnikow) (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 1 (1924), No. 1, pp. 22–28*).—Ammonium nitrate shows itself, as regards plant nutrition, to be a pronounced physiological salt. It was not possible, on the basis of the data here obtained, to support the view that this salt is a good regulator of the reaction favorable to plant growth.

Reduction of nitrates during autolysis in lupine seedlings [trans. title], A. I. Smirnov (A. J. Smirnow) (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 1 (1924), No. 3, pp. 200–204*).—The author, having studied autolysis in com*minuted lupine seedlings and juices expressed from them, furnishes details as* to the carbohydrates, oxygen compounds, nitrates, duration of the autolytic process, and temperatures.

The oxygen requirement of plant roots [trans. title], A. Kudriavtseva (Kudrjawzeva) (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 1 (1924), No. 1, pp. 48–67, figs. 4*).—Study of atmospheric oxygen utilization by oats, wheat, buckwheat, sunflower, mustard, peas, and flax showed a high oxygen requirement by the plant roots. Nitrites appeared in the solutions where only nitrates had been furnished.

The presence of certain organic compounds in plants and their relation to the growth of other plants, R. C. Collison (*Jour. Amer. Soc. Agron., 17 (1925), No. 1, pp. 58–68*).—Studies bearing upon the need of proper proportion between energy material and nitrogen supply have been noted (E. S. R., 48, p. 20). The present paper deals with another and presumably separate effect of energy material upon the growth of plants, to which, it is thought, no reference has been made in related literature.

"In some cases with seedlings, not in all, however, it was noted that an injurious effect showed itself at once in cultures in which there was sufficient available nitrogen to maintain the plant for some time. In some cases this retarding effect was noted even in the length of time of germination. Since many of these cultures had an ample supply of available nitrogen, it was difficult to correlate this immediate injurious effect with the utilization of the nitrogen by carbohydrate decomposing organisms, since the latter effect appears only after some time, depending on the rate of disappearance of the nitrogen supply. Some other causes therefore had to be looked for." Experimentation developed facts seeming to indicate the presence in straw of a definite soluble compound having toxic properties. The injuries, it is thought, may be caused to some extent by any one of four compounds, tyrosine, dihydroxystearic acid, vanillin, and cumarin, which are discussed in this connection. The presence of such compounds raises also the question of their possible importance in the effect of one crop on following crops.

The organic substances found in alfalfa, timothy, and straw, if present in fresh sap, may serve as inhibitors against parasitic fungi. Salicylic acid may be protectively toxic on account of an antiseptic action due to its phenolic relation, as well as its acidity.

The flora of the Cayuga Lake Basin, New York: Vascular plants, K. M. WIEGAND and A. J. EAMES (*New York Cornell Sta. Mem. 92 (1925), pp. 5–491, pl. 1, fig. 1*).—This is a manual of the vascular flora of the Cayuga Lake Basin, a drainage area in central New York south of Lake Ontario.

The Gram staining properties of the micrococci, G. J. HUCKER (*Centbl. Bakt.* [*etc.*], *1. Abt., Orig., 95 (1925), No. 7–8, pp. 446–450*).—"As a whole, the micrococci appear to be very variable in their reaction to the Gram stain, and its usefulness as diagnostic test is largely confined to the differentiation of a few species. It is especially useful for freshly isolated culture from lesions. These appear to show greater constancy."

GENETICS

Genetics and dairy cattlemen, R. R. GRAVES (*Breeder's Gaz., 89 (1926), No. 8, pp. 230, 231, 252–254*).—A brief review of the influence of early investigators from the time of Aristotle on the development of genetics, with special reference to Pasteur's final proof of the fallacy of spontaneous generation.

A new sex-linked mutation in the silkworm, Bombyx mori L., Y. TANAKA (*Jour. Dept. Agr., Kyushu Imp. Univ., 1 (1924), No. 2, pp. 135–150, pl. 1*).—A character described as "elongate," which produces a lengthening of the first two abdominal segments of the silkworn larva, was found to be due to a sex-linked factor recessive to the normal. The mode of inheritance corresponds to the factor for translucent (E. S. R., 48, p. 764), and further confirms the hypothesis that the sex chromosome complex of the silkworm is of the ZW type.

The Japanese waltzing mouse, its origin and genetics, W. H. GATES (*Natl. Acad. Sci. Proc., 11 (1925), No. 10, pp. 651–653*).—Evidence is presented to indicate that the Japanese waltzing mouse was derived from *Mus wagneri* and not from *M. musculus*, the common house mouse. The former is a native of Central Asia, which coincides with the earliest records of Japanese mice. Both types have similar body measurements, eye pigmentation, and protein specificities. The heterosis exhibited in crosses with the common fancy varieties indicates that the two are different species. In a cross of Japanese mice and common mice involving 5 pairs of coat and eye characters, it was found that the characters of the waltzers tended to remain together instead of

segregating in 1,146 F_2 and 1,289 back-cross individuals. The body measurements showed a similar tendency to cling together. This association was not apparent in later generations.

Contributions to the genetics of barley.—I, Type of spike, nakedness, and height of plant, H. and O. Tedin (*Hereditas, 7 (1926), No. 2, pp. 151–160, figs. 2*).—A single factor difference was apparent between 2-rowed type and 6-rowed type in barley. Within the 2-rowed type there was monohybrid segregation into one type having lateral florets with rather large, well developed palae and another termed "subdeficiens," with more reduced lateral florets. Trapped and naked grains showed monohybrid segregation independent of that of spike type. The marked correlation between type of spike and height of plant was most probably due to linkage between the factor for 2-rowedness and a plant height factor. The intermedium plants in most segregating F_3 families were taller than the 6-rowed plants and shorter than the 2-rowed, but they averaged taller than either in families where the linkage between type of spike and height was broken.

The genetics and morphology of some endosperm characters in maize, P. C. Mangelsdorf (*Connecticut State Sta. Bul. 279 (1926), pp. 513–614, pls. 6, figs. 26*).—Preliminary investigations of a number of new characters which influence the development of the endosperm in corn, their breeding behavior, morphology, effect upon development, and their relation to each other and to other characters are reported under the following topics:

I. *Defective seeds.*—Defective seeds (E. S. R., 49, p. 826) have been the most frequent variations to arise by mutation in homozygous inbred strains of corn. Of 14 stocks segregating for defective seeds, crossed in 82 combinations, only 2 genetically alike have been found. Histological studies showed that normal fertilization apparently occurs in the formation of these seeds, and that both endosperm and embryo are produced. However, these structures develop very slowly, remain rudimentary, and are affected to almost the same degree by lethal factors. The relative development of the 14 stocks of defective seeds as compared to normal seeds on the same ears ranged from 2.4 per cent to 59 per cent, on the dry-weight basis. Indications of linkage were the de_3 factor with a factor for white seedlings, probably w_2 (second linkage group), with about 11 per cent of crossing-over and the de_1 and de_6 factors with the factor for sugary endosperm (third linkage group), with 39 and 26 per cent of crossing-over, respectively. Linkage between two different defectives was indicated in four crosses. Besides the 13 endosperm characters causing one-fourth of the seeds to be defective, there was a plant character causing all seeds on one-fourth of the plants to be defective.

II. *Nonhereditary defective seeds.*—Four morphologically distinct types of nonhereditary defectives resembling certain of the hereditary types discussed were found. Parthenocarpic defectives resemble complete defectives, contain neither endosperm nor embryo, and are the result of a marked growth of the nucellus and pericarp following pollination without fertilization. Arrested seeds contain endosperm and embryo retarded in development due to competition or physiological dominance of normal seeds on the same inflorescences. Germless seeds, containing endosperm tissue but no embryo, seemed due to single instead of the usual double fertilization. Miniature seeds, normal in structure although somewhat reduced in size, might be the result of irregularities in fertilization such that their endosperm is diploid instead of triploid in chromosome number.

III. *Genetic factors which influence the texture of the endosperm.*—Brittle endosperm, a new character intermediate in appearance between sugary and shrunken, is inherited as a simple recessive. Crosses between brittle and

sugary or shrunken give starchy seeds in F_1 and 9:3:4 or 9:7 ratios in F_2, without indication of linkage in either series of crosses.

The endosperm of corn apparently attains its maximum development when genetically starchy. The relative development of waxy, floury, shrunken, sugary, and brittle seeds is always less than of starchy seeds from the same ears. The characters affecting the texture of the endosperm do not differ fundamentally from the defective seeds which influence primarily the amount. To attain the normal or starchy condition the seed of corn must be dominant for at least 18 genetic factors.

IV. *Premature germination of maize seeds and genetic factors which govern dormancy.*—Mendelian factors found to be involved in the maintenance of a normal period of dormancy in corn seeds included ge_1, ge_2, ge_3, ge_4, and ge_5, single factors, any one of which in a homozygous recessive condition causes premature germination; ge_6 and ge_7, a pair of independent duplicate factors causing premature germination when both are present in the recessive condition; and ge_8 and ge_9, a pair of linked duplicate factors causing premature germination when both are present, with about 34 per cent of crossing-over. Linkage of ge_1 with the gene for sugary endosperm was apparent with about 40 per cent crossing-over, whereas ge_2, ge_3, and ge_5 seemed independent of sugary.

An apparent case of close linkage between endosperm color and several types of germinating seeds is probably due to the physiological effects of premature germination upon the accumulation of pigment in the cells of the endosperm. A similar association between germinating seeds and white seedlings may also be due to physiological complications. Seeds germinating at an early stage produce only white plumules, whereas those which germinate later have normal green sprouts. Premature germination seems due to the lack or loss of inhibiting substances normally supplied by the plant to the growing seeds. It is suggested that many genetic factors are involved in the maintenance of a normal period of dormancy in corn seeds.

Sea Island cotton: Inheritance of corolla colour, L. S. Budd (*Trop. Agr.* [*Trinidad*], *3* (*1926*), *No. 3, pp. 56, 57*).—White flowered plants noted in a plat of pure A. N. Sea Island cotton with full golden yellow flowers bred true and had a shorter lint than the original strain. The fundamental difference between the white and yellow flowered plants seemed due to a single pair of allelomorphs. There seems to be also at least one modifying factor which may control the depth of yellow pigment in colored individuals. No tendency was evident for the white color to be associated with either long or short lint.

The inheritance of resistance of oat hybrids to loose smut, G. M. Reed (*Mycologia, 17* (*1925*), *No. 4, pp. 163–181*).—The inheritance of resistance to the loose smut of oats, *Ustilago avenae*, in a hybrid between *Avena nuda inermis*, a very susceptible variety, and *A. sativa* (Black Mesdag), a highly resistant sort, was studied at the Brooklyn Botanic Garden, the data going into the F_4 generation.

Resistance to *U. avenae* seemed dominant and susceptibility recessive, a single factor difference between the two parents being apparent. Different combinations of morphological characters and smut resistance could be obtained, and a whole series of new types of resistant oats, some with naked and some with hulled grain, might be developed.

Hereditary correlation of size and color characters in tomatoes, E. W. Lindstrom (*Iowa Sta. Research Bul. 93* (*1926*), *pp. 99–128, figs. 4*).—As a further contribution to the genetics of the tomato (E. S. R., 52, p. 729), the author reports that a study of seedlings obtained by crossing varieties of tomatoes contrasting sharply in color and size characters points to the fact

that genes carrying flesh and skin color *Rr* and *Yy*, respectively, are inherited independently of each other, and accordingly reside in different pairs of chromosomes. Evidence was obtained to indicate that genetic linkage occurs between color factors and size factors. Linkage was observed more frequently in the case of skin than flesh-colored factors.

Using the partial regression coefficients as indicators, the author found that the time of flowering and the days to harvest had no appreciable effect on fruit weight. The number of seed locules also had practically no influence on fruit weight. Although both the polar and equatorial diameters had a direct relation to fruit weight, the influence of the polar diameter was much the smaller. The author concludes that hereditary factors for size characters depend on the same chromosomal mechanism that controls color inheritance.

Hereditary predispositions to dizygotic twin-births in Norwegian peasant families, K. Bonnevie and A. Sverdrup (*Jour. Genetics, 16 (1926), No. 2, pp. 125–188, pls. 2, figs. 22*).—The inheritance of a tendency for twinning has been studied from the records of 12,034 births among families located in four more or less isolated valleys in Norway and Sweden. The 125,950 births in Norway during 1916 and 1917 and 537 multiple births which occurred at the Women's Hospital at Christiania were also used in connection with the study.

There were 1.46 per cent of twin births in the entire Norwegian material, but in the three Norwegian family groups this percentage was increased to 3.25. Certain lines of the families showed marked differences, twinning being as high as 8.23 per cent in one line, while none occurred in another line. Monozygotic and dizygotic twins were separated in the analysis on the hypothesis that the number of dizygotic twins of the same sex was equal to the number of twins of the opposite sex. A distribution of the percentage of twin births among mothers of different ages from the Norwegian population showed that monozygotic twins were produced at approximately the same rate at all ages, while the percentage of births resulting in dizygotic twins was very small for the younger mothers but increased with age, reaching a maximum at 34 to 39 years and being followed by a decrease. The other data also showed an influence of age on the production of dizygotic twins. A similar result was found for first births, indicating that age is the important factor rather than the parity.

A study of the possible relation between twin lines and general fertility showed that in the entire family material there were averages of 6.09 ± 0.065 births per marriage and in the twin families 6.78 ± 0.222 births per marriage, thus indicating a slightly greater fertility in the twin families. There was no evidence that mothers of twins were more fertile than other mothers in the same line.

In studying the means of inheritance of dizygotic twins, the ancestry of nearly 300 twin-bearing mothers has been traced back to the second half of the seventeenth century, largely by the use of church records. Studies of these pedigrees have shown certain ones with definite twin-bearing tendencies inherited in a sex-linked manner, while in others twin bearing has appeared to be inherited as a nonsex-linked dominant character, but many obvious exceptions to either of these explanations were found. The inheritance of twinning by a recessive factor was deemed the most logical. Among 176 twin-bearing mothers twinning had occurred on both the mother's and father's side of the pedigree in 86 cases, and in 75 others it had occurred in the pedigree of the one side which it was possible to investigate. Five other pedigrees showed no evidence of twinning in the ancestry, but these pedigrees were somewhat incomplete.

In connection with the work a case was also described of one woman who had produced 8 pairs of twins and 5 single children. Her pedigree traced back for three generations showed no evidence of twinning. This tends to indicate that dizygotic twins may be due to different factors.

The Mendelian nature of sex studied by the rhythm of Mendelian segregation [trans. title], J. and J. FRATEUR (*Genetica [The Hague]*, 7 (1925), No. 1-2, pp. 103-110).—The author shows that sex in fowls behaves the same as characters determined by a single pair of Mendelian factors when a heterozygous individual is mated with a homozygous recessive.

Further developments on the dynamics of ovarian hypertrophy, A. LIPSCHÜTZ and H. E. V. VOSS (*Brit. Jour. Expt. Biol.*, 3 (1925), No. 1, pp. 35-41, pls. 2).—In continuing this series of studies (E. S. R., 54, p. 431) the left ovary and the greater part of the right ovary of three cats were removed, leaving only an ovarian fragment, and in two other cats the left ovary was divided into a small upper and a large lower fragment. The right ovary was untouched. The ovarian fragments were removed after five months and microscopically studied. The results showed that the upper fragments behaved normally when no ovarian tissue was removed, but when all of the ovarian tissue except that of the fragment was taken away the volume of the fragment was greatly increased by the formation of large follicular cysts with an almost complete exhaustion of young ova.

It is concluded that the hypertrophy of the small remaining portion of ovarian tissue and the decreased number of young ova are due to a general factor rather than to a local cause or operative interference. It is noted that much sclerotic connective tissue was found in the lower fragment in the two cases in which all the ovary remained, but many young ova were also present.

Studies on the relation of gonadic structure to plumage characterisation in the domestic fowl.—I, Henny-feathering in an ovariotomised hen with active testis grafts, A. W. GREENWOOD and F. A. E. CREW (*Roy. Soc. [London], Proc., Ser. B*, 99 (1926), No. B 696, pp. 232-241, pls. 2).—The authors describe a Brown Leghorn female from which the ovaries were removed at 4 days of age and chopped testicular fragments were inserted in the abdominal cavity, in experiments conducted at the animal breeding research department, University of Edinburgh.

The adult plumage and other secondary sex characters developed as in a normal cock. At the age of 17 months, following a complete molt, the developed plumage was as that of a normal hen. A post-mortem examination of the bird showed the presence of large amounts of testicular tissue and a fragment of degenerated ovarian tissue. Many motile sperms were associated with the testicular tissue.

Hen feathering in male birds is discussed, and it is concluded that the function of an ovary is physiologically more expensive than that of a testicle. It was shown by Finlay (E. S. R., 54, p. 825) that large amounts of testicular tissue resulted in henny feathering, and it is therefore suggested that the henny feathering was due to an increased amount of testicular tissue in this bird, which exerted an influence on the body equivalent to that of an ovary.

"Somatic segregation" in domestic fowl, A. S. SEREBROVSKY (*Jour. Genetics*, 16 (1925), No. 1, pp. 33-42, pl. 1).—In studies at the Institute of Experimental Biology at Moscow, the author has observed feathers and parts of feathers, mostly in heterozygous birds of the Plymouth Rock, Plymouth Rock-Orloff and Andalusian breeds, which distinctly showed the appearance of the recessive character. This has been attributed to faulty cell division, resulting in the elimination of the chromosome carrying this gene from certain portions

of the soma. The elimination of the sex-linked gene for silver was usually associated with the elimination of the barred gene, which was also sex-linked. A certain amount of crossing over in such cases was indicated, but the amount was not proved. The appearance of piebaldness in animals and the difference in the color of feathers on certain parts of the body of fowls, especially males, are discussed with reference to this hypothesis, based on an inheritance of factors causing such faulty cell division in certain parts of the body.

The early development of Cavia: Note on associated remains of previous placentation, N. H. W. MACLAREN (*Roy. Soc. [London], Proc., Ser. B, 99 (1926), No. B 696, pp. 230, 231, pl. 1*).—The microscopical appearance of two early blastocysts before implantation is given, as well as photographs of placental remnants found in uteri of guinea pigs as long as 76 days after parturition which at first sight resembled blastocysts.

Fertility of the rat, Mus norvegicus, H. W. FELDMAN (*Natl. Acad. Sci. Proc., 11 (1925), No. 12, pp. 718–721*).—A brief account is given of the results of experiments dealing with fertility in the rat conducted at the Bussey Institution.

The reproductive vigor and growth of 459 female and 377 male rats were determined in 1,445 different matings, which consisted of the original descendants of 3 litter of the red-eyed yellow mutant variety through 4 generations of brother-sister matings. Each male was mated with each of his sisters. The control stock for this experiment consisted of matings more distantly related than first cousins and a small stock of the fifty-second generation of H. D. King's inbred albinos. All animals were first mated at 90 days, and tests were completed at less than 1 year of age.

The results indicated that fertility was itself a manifestation of various other phenomena and proved to be essentially an expression of the reproductive vigor of the individuals mated. The female appeared to limit the size of the litter, as males were either sterile or produced sufficient spermatozoa for normal fertility. The data are tabulated showing the litter sizes, fates of the individuals, and other related factors for litters produced by females of different ages. The average litter size was found to increase with the age of the dam up to the 150-179-day age group. This was also the age of the attainment of maximum size before the slow accumulation of advanced age. There was a correlation of $+0.856\pm0.030$ between the dam's weight at 90 days of age and the average litter size. The number of individuals born dead obviously affected the size of the live litters.

The data show that pregnancy followed very promptly after mating, the average being 3.2 days for first matings, but the average time required in later matings was slightly longer. A correlation of -0.193 ± 0.033 was obtained between the time from mating to parturition and the 90-day weight. The effects of inbreeding and season were also noted. The generation averages indicated that litter size decreased with successive brother-sister matings, and the frequency of stillbirths also increased, probably due to a reduction in general vigor.

The maximum litter sizes occurred in June, followed by a steady decline to October, with another increase in November and December. Segregation for reproductive vigor was indicated in certain lines, but the manner of segregation was not clear.

The monthly birth [trans. title], J. SANDERS (*Genetica [The Hague], 7 (1925), No. 1–2, pp. 87–101, figs. 18*).—The legitimate births in the Netherlands during the period of 1907 to 1923 and the illegitimate from 1916 to 1923 are tabulated according to sex and monthly distribution on a percentage basis. The

first born and those born dead are recorded separately. The effects of certain years and the size of community have also been considered.

The curve showed that there was a very marked rise in the percentage of males and females born during February and March among first born, with very sharp decreases before and after this period. Both sexes showed a small break in the rate of decrease in August and September. The curve for those born in later parities were bimodal, one mode occurring in February and one in September. Neither was nearly as high as the February-March peak for the first born, but the September peak was higher than that for the first born. The two sexes were almost identical in both groups. The size of the community appeared to have a distinct effect on the monthly distribution of births. The first-born curves for communities of less than 20,000 showed a very high peak in February-March, but no pronounced peak occurred in communities over 20,000, though there was a higher rate from February to September than from October to January.

FIELD CROPS

The moving average as a basis for measuring correlated variation in agronomic experiments, F. D. Richey (*Jour. Agr. Research* [U. S.], *32* (*1926*), *No. 12, pp. 1161–1175*).—This paper presents a modification and certain simplifications of the moving average method (E. S. R., 51, p. 33) and compares this method with that offered by Student (E. S. R., 50, p. 827). Certain aspects of the standard error of a difference are reviewed.

[Field crops work at the Alaska Stations], C. C. Georgeson (*Alaska Stas. Rpt. 1924, pp. 4, 5, 9–15, 18, 20–24, figs. 2*).—Experiments with field crops (E. S. R., 52, p. 528) reported on in continuation of previous work comprised varietal trials with wheat, barley, oats, and potatoes; tests of potato seedlings; observations on the relative maturity of wheat and barley varieties and on the effects of previous crops on wheat yields; and field trials, and, with some crops costs of production, with spring wheat, barley, oats, peas, vetch, alfalfa, clover, potatoes, rutabagas, mangels, carrots, artichokes, sunflowers, and miscellaneous grasses.

In germination tests of immature grain it was found that wheat, barley, and oats can be cut for seed 20 days after blooming, i. e., 10 days before maturity, and that they will give a high rate of germination provided the grain is properly cured.

[Field crops investigations at the U. S. Field Station, Sacaton, Ariz., 1922–1924], C. J. King and A. R. Leding (*U. S. Dept. Agr., Dept. Circ. 372* (*1926*), *pp. 11–31, figs. 3*).—Continued activities (E. S. R., 50, p. 132) reported on include variety tests with cotton, corn, barley, grain sorghums, wheat, sorgo, alfalfa, and sweet potatoes; breeding work with cotton, corn, and barley; fertilizer, irrigation, spacing, and planting trials, and studies of pollination and cell-sap properties with cotton; and seeding and irrigation tests with wheat. Many of the research studies have been noted earlier.

[Field crops experiments in Louisiana], A. F. Kidder et al. (*Louisiana Stas. Rpt. 1925, pp. 8, 9, 11, 27, 28, 41–44, 50, 51*).—Continued investigations (E. S. R., 53, p. 528) at the stations for which results are briefly noted included rotations; variety tests with corn, oats, cotton, lespedeza, and velvet beans in corn; breeding work with corn; strain tests with certified seed potatoes; fertilizer tests with cotton, with and without dusting for weevil control; and seeding, fertilizer, and rotation studies with rice (E. S. R., 54, p. 35).

[Agronomic work in New Mexico] (*New Mexico Sta. Rpt. 1925, pp. 36, 37, 40–46, 56, 57, figs. 2*).—Leading among the field crops varieties were Turkey and Kubanka wheat, Gray Winter and Texas Red oats, G 2.518 barley,

Rosen rye, Mexican June and Dwarf June corn, Mebane, Mueck, and Acala cotton, and Hairy Peruvian alfalfa.

From three years' experiments it seemed that when sugar beet seeds are planted in the fall, not after November, practically all plants may be expected to produce seed stalk the next spring. Beets from the seed from the 1923 crop did equally as well at the Utah Experiment Station as commercial seed or as select seed produced biennially.

Cotton irrigated weekly somewhat outyielded that irrigated every 2 weeks and produced much more than cotton irrigated every 3 weeks. Eight-in. distances gave the highest yields in spacing tests. Topping was followed by a reduced yield.

Nothing was gained by using glass instead of cheesecloth as a seed bed cover with tobacco. A stand was more easily secured if a layer of burlap on the ground was kept moist until the seeds germinated.

Results to date with chamiza indicate that while seeding may be done at any time during the year, little or no germination will be obtained between April 1 and August 1; in fact, germination has been very light until early September. Seed gathered less than a year has always been low in germination. With light precipitation, chamiza seed appears to germinate much more readily after it has lain near the surface of the soil for a year or more than shortly after planting.

Although previous failures in potato growing seemed largely due to nematodes, certified Irish Cobbler seed from northern sources planted in virgin soil presented no evidence of infestation on the hair roots and made good yields. There appeared to be a climatic factor affecting yields.

[Cooperative experiments with field crops in Ontario] (*Ontario Dept. Agr., Agr. and Expt. Union Ann. Rpt., 47 (1925), pp. 5–31, figs. 3*).—Among the cooperative projects reported on were those in field husbandry in 1925 by C. A. Zavitz, fertilizer experiments on potatoes by S. Waterman, and weed eradication by J. E. Howitt.

[Field crops experiments in the Philippine Islands], S. YOUNGBERG (*Philippine Bur. Agr. Ann. Rpt., 24 (1924), pp. 33–65, 82–89, 101–106, 109, 110*).—These pages report the continuation of various experiments (E. S. R., 53, p. 133) with corn, rice, adlay, tobacco, sugar cane, peanuts, sweet potatoes, cassava, abaca, agaves, cotton, kapok, roselle, and miscellaneous legumes, and forage, fiber, and root crops.

Alfalfa field registration, H. L. BOLLEY and O. A. STEVENS (*North Dakota Sta. Circ. 30 (1926), pp. 8, fig. 1*).—The requirements for registering fields of Grimm alfalfa in North Dakota are described.

The growing of lucerne, C. HEIGHAM (*Jour. Min. Agr. [Gt. Brit.], 32 (1926), No. 12, pp. 1089–1096.*)—This article summarizes the proceedings of the conference on alfalfa culture held at Rothamsted in January, 1926, and gives information on the history and status of the crop, seed inoculation work at Rothamsted, and problems of the plant, fertilizing, cultivation and management, and uses.

Varieties of ensilage corn for Maine, K. SAX and I. M. BURGESS (*Maine Sta. Bul. 330 (1926), pp. 49–56, figs. 3*).—Sweepstakes, averaging about 17 tons per acre, was outstanding in variety trials with silage corn during 3 years.

Fertilizers for corn, R. M. SALTER (*Ohio Sta. Bimo. Bul., 11 (1926), No. 3, pp. 91–97*).—Field tests in 13 counties in Ohio suggest that while acid phosphate alone may be quite profitable when applied to corn (E. S. R., 53, p. 735) receiving no manure, a mixed fertilizer containing both phosphoric acid and potash will give more net return per acre, and, on thin land without clover, the inclusion of nitrogen in the fertilizer may make it still more effective.

Apparently the consistent use of manure and acid phosphate on corn in a rotation including clover once in 3 or 4 years may be expected to maintain the yield at a level approximately double the State average. In general, the proper fertilizer application on corn will vary from 200 to 400 lbs. per acre, depending upon the soil and the fertilizer and its distribution among the crops of the rotation. The inclusion of nitrogen in the fertilizer applied broadcast to corn where clover is grown regularly in rotation seemed of doubtful value. Recent experiments on the Paulding County farm emphasized the merits of using sweet clover as a green manure for corn.

The use of Ohio standard fertilizers on corn is suggested, and hill and broadcast methods of application are compared.

Some modern problems of scientific research for the improvement of cotton growing, B. C. BURT ET AL. (*[Bombay]: Indian Cent. Cotton Com., 1926, pp. 68, pls. 2*).—Among the papers presented at the Indian Science Congress at Bombay in January, 1926, were The Study of the Cotton Fibre, by A. J. Turner; The Improvement of the Plant, by T. Trought; Reduction of Loss in Cotton Due to Diseases in the Bombay Presidency, by G. S. Kulkarni; Reduction of the Loss Caused by Insects, by M. A. Husain; Special Problems of Cotton Growing in Canal Colonies, by W. Roberts; and The Cotton Growing Problems of the Black Soils of India, by A. Howard and H. A. Hyde. In an introduction B. C. Burt outlines the current activities of the Indian Central Cotton Committee.

Reports on experimental work on cotton carried out on certain State farms in Queensland during 1924–25, G. EVANS ET AL. (*[Queensland Dept. Agr. and Stock], Rpts. Expt. Work on Cotton, 1924–25, pp. 48, pls. 7, figs. 11; also in Queensland Agr. Jour., 25 (1926), No. 2, pp. 133–177, pls. 7, figs. 11*).—Experiments with cotton reported on from three centers in Queensland included variety, planting, cultivation, and fertilizer tests, breeding work, rotations, comparisons of annual v. ratoon crops, and of fallow v. continuous crops, and trials of trap crops.

Potatoes: Certification for seed in North Dakota, H. L. BOLLEY and W. G. COUEY (*North Dakota Sta. Circ. 31 (1926), pp. 12, figs. 4*).—Regulations and instructions for the production of certified seed potatoes are outlined.

Fertilizers for Irish potatoes, J. R. COOPER and C. W. RAPP (*Arkansas Sta. Bul. 206 (1926), pp. 15*).—Fertilizer trials with potatoes (E. S. R., 55, p. 29) near and at the station and near Fort Smith, Ark., showed 625 lbs. of 8–4–4 fertilizer, followed by an 8–4–0 formula, to give the best results on light soils. Only phosphoric acid increased yields when used alone. On the heavier soils studied 8–4–4 and 8–4–0 mixtures were equally good, and no gains were obtained from the use of potash. The best results were had when fertilizers were applied in the row at planting time. Nitrogen in sodium nitrate seemed to give better results than that supplied in cottonseed meal. The percentage of culls produced was apparently not related to the amount of precipitation.

Experiments with Sudan grass [trans. title], S. VOROB'EV (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 2 (1925), No. 11, pp. 726–733*).—Field and laboratory tests during five years showed Sudan grass to excel under droughty conditions, to posses a transpiration coefficient below that of millet, and to equal hay of cereals in average chemical composition. Sudan grass yielded a maximum of nutrients per unit area when cut before blooming.

The effect of moisture on the loss of sugar from sugar beets in storage, D. A. PACK (*Jour. Agr. Research [U. S.], 32 (1926), No. 12, pp. 1143–1152, fig. 1*).—Storage experiments with sugar beets by the Bureau of Plant Industry, U. S. D. A., conducted under controlled moisture conditions with constant temperatures, indicated the importance of moisture in the storage of sugar beets

and showed that moist-stored sugar beets lose less sugar than similar sugar beets stored dry.

The loss of sugar beets increased as the dryness of the storage conditions increased in degree. Moisture conditions in equilibrium with the water content of the beet tissues are required by sugar beets during storage in order to minimize their sugar loss, i. e., an equivalent of about 12 atmospheres osmotic pressure. The sugar losses of commercial sugar beets under practical storage conditions were decreased from 40 to 50 per cent by moist storage.

It is emphasized that sugar beets should be kept alive in storage, the best results being had when the tissues of the living beets have normal water content and are healthy, properly aerated, and dormant. Dormancy under such conditions may be produced by low temperatures.

Variation in the composition of frozen beets [trans. title], J. Vondrák (*Ztschr. Zuckerindus. Čechoslovak. Repub., 50 (1925), No. 15, pp. 130–132*).—Analyses of sugar beets before and after freezing demonstrated that in a hard frozen beet the beet invertase seems to cause an increase of the invert sugar content during the freezing process, although the effect of microorganisms is excluded under these conditions. The progress of inversion is noticeably accelerated when the frozen beet thaws; under this condition the contents of the ruptured cells are mixed with the contents of special cells containing invertase. The beet suffers the most damage when thawing is so prolonged that development of microorganisms occurs. The invert sugars increased faster after repeated freezings than in beets frozen only once.

Flowering of sugarcanes, M. Ghosh (*Agr. Jour. India, 21 (1926), No. 1, pp. 14–17*).—Tasseling did not seem to be necessarily detrimental to the sucrose content in Saretha canes at Sabour. The canes in flower maintained their superiority in richness and purity of juice over those not flowering and also seemed more resistant to cold.

Some effects of fertilizers on sweet potatoes, J. T. Quinn (*Amer. Soc. Hort. Sci. Proc., 22 (1925), pp. 360–363*).—Although the total yields of Porto Rico sweet potatoes were very little affected by fertilizer treatments at the Missouri Experiment Station, the percentages of marketable roots increased where fertilizers containing potash were used. A very definite correlation existed between the use of potash fertilizer and the percentage of carbohydrates, this being especially true with the starches, which were highest where potash was used and which increased with the amount applied. The percentages of sugars were also higher where the potash fertilizers were used, with the exception that acid phosphate gave a small increase over the potash used in a mixed fertilizer. The form of at least Nancy Hall and Porto Rico sweet potatoes was observed to be greatly influenced by potash fertilizers. The Porto Rico produced a more blocky, uniform sweet potato where potash was applied.

The influence of nitrogen, phosphorus, and potash separately and in combination on sweet potato production, F. W. Geise (*Amer. Soc. Hort. Sci. Proc., 22 (1925), pp. 363–370, fig. 1*).—During a 5-year study at the Maryland Experiment Station plats treated with nitrogen, phosphorus, and with a nitrogen-phosphorus combination made average relative increases of 35.2, 37.7, and 32.4 per cent, respectively, over the average of the check plats, and plats receiving potash, phosphorus-potash, and nitrogen-phosphorus-potash made relative increases of 160.5, 179.1, and 187.4 per cent, respectively, over the check plats. Those plats receiving potassium chloride either alone or in combination with nitrogen or with nitrogen-phosphorus gave the largest increase of any of the treated plats. Decided benefits were derived from liming a strongly acid soil. One year's results with 4 of the fertilizer analyses most widely used in

sweet potato production in Maryland showed a 2–8–10 analysis to outyield a 2–8–8, and a 3–8–10 to outyield a 3–8–8 in production of marketable sweet potatoes.

Roll tobacco, V. F. Olivier (*Union So. Africa Dept. Agr. Jour., 12 (1926), No. 2, pp. 123–131, figs. 8*).—A brief exposition of the roll tobacco industry in Oudtshoorn and surrounding districts in the Cape Province.

Wheat growing in Kenya Colony, G. J. L. Burton (*Kenya Colony Dept. Agr. Bul. 2 (1925), pp. 26*).—Cultural directions, varieties, pests, and diseases of wheat are described, with comment on the status of the crop in the Colony.

Testing of New Zealand-grown wheats, L. D. Foster (*New Zeal. Jour. Agr., 31 (1925), Nos. 5, pp. 296–301, fig. 1; 6, pp. 375–383, figs. 4; 32 (1926), Nos. 1, pp. 26–33, figs. 7; 2, pp. 93–104, figs. 6*).—Milling and baking tests were made on samples of wheat from the 1924 and 1925 crops similar to those recorded previously. (E. S. R., 52, p. 230.)

Five samples of Velvet averaged 73.7 per cent flour and fully maintained the good average characteristics of this variety. As a whole, the miscellaneous wheats gave very good milling results, Hybrid W, Zealand, and Essex Conqueror being outstanding. Of the wheat growing districts, Canterbury Province more than maintained its average (73 per cent) for the percentage yield of flour. The Lake district, represented by considerably fewer samples, was practically as good with 72.9 per cent, whereas the samples from Southland were again rather low with 70.2 per cent. Again no relationship could be found between yield of flour and calculated weight per bushel.

The few samples of Velvet received maintained a good average, and the miscellaneous varieties were again remarkable for their average very good strength. On their protein content Essex Conqueror, Yeoman, Marquis, Scandinavian, and Snowdrop may be classified as strong wheats, and Hybrid W, Zealand, Queen Fair, Major, Jumbuck, and Red Fife as medium strong wheats. Again no correlation was found between calculated weight per bushel and protein content.

Flour milled from Essex Conqueror produced the best loaf of the varieties tested in 1925. Yeoman flour made an excellent loaf, and samples of Velvet, Marquis, and Red Fife produced very good loaves. Durum flours failed in regard to breadmaking qualities. The order of the strength of the flours as determined by baking tests was, on an average, also the order of the protein content of the various samples. Individual protein content and loaf volume were more closely correlated when comparing flours from wheats coming from the same districts. However, the flours from wheats grown in Lake and Southland Counties generally produced better loaves than their protein content indicated. Flours from Canterbury wheats generally gave results in which the protein content was a good index to the baking value.

The hydration capacity of the moist glutens of flours obtained from 32 New Zealand-grown varieties of wheats did not always indicate the quality of the flours as revealed by baking tests. However, a fairly close relationship was observed between hydration capacity and texture of the loaves. The quality of gluten as determined, respectively, by hydration capacity and by visual inspection of the gluten did not appear to be related, and the initial pH of the flour was not connected with loaf volume. Among the flours examined it was found that in those of approximately the same protein content the degree of buffering was closely correlated with the loaf volume. A highly buffered flour, even of high protein content, produced a loaf of poor volume, and conversely a lightly buffered flour, even though low in protein content, produced a loaf of good volume.

The influence of temperature on spike production in winter rye and winter wheat [trans. title], B. A. VAKAR (*Nauch. Agron. Zhur.* (*Jour. Landw. Wiss.*), *2* (*1925*), *No. 12, pp. 776–785, figs. 2*).—Temperatures as low as from 2 to 6° C. (35.6 to 42.8° F.) during the first 3 to 12 days after germination did not affect spike production or time of spike exsertion in winter rye and winter wheat differently than did temperatures of from 15 to 18°. Winter and spring cereals appear to differ in the length of the vegetative period; in these experiments that of spring wheat was 148 days and winter rye and winter wheat from 172 to 204 days. The high temperature and intense illumination at the end of the period of tuft formation favorably influenced spike production in these winter cereals.

Destruction of tall couch, F. W. GREENWOOD (*New Zeal. Jour. Agr.*, *32* (*1926*), *No. 2, pp. 120, 121, figs. 3*).—Where oats and vetch were seeded at acre rates of 2 and 1 bu., respectively, on the well prepared stubble of badly infested oats after harvest, couch grass (*Agropyron repens*) practically disappeared when the vetch was left for seed. When the oats and vetch were cut for hay the couch grass decreased greatly but did not entirely disappear, and an area grazed almost continuously reverted to couch grass.

HORTICULTURE

Plant-growing and plant-growing structures, C. H. NISSLEY (*N. J. Agr. Col. Ext. Bul. 51* (*1926*), *pp. 48, figs. 53*).—An illustrated circular presenting information on the construction and management of hotbeds and sash houses, especially those heated with flues or hot water.

[Horticultural investigations at the Alaska Stations], C. C. GEORGESON (*Alaska Stas. Rpt. 1924, pp. 2, 3, 4, 5–8, fig. 1*).—This report, as usual (E. S. R., 52, p. 536), comprises brief varietal notes on a large number of fruit, vegetable, and ornamental plants.

[Horticultural investigations at the U. S. Field Station, Sacaton, Ariz., 1922–1924], C. J. KING and A. R. LEDING (*U. S. Dept. Agr., Dept. Circ. 372* (*1926*), *pp. 31–45, figs. 13*).—Continued efforts (E. S. R., 50, p. 137) were made during the year to improve the Sacaton Bermuda onion strain, a selection of the ordinary yellow Bermuda onion.

Among peaches tested, those of the honey type, namely Pallas and Lukens, gave satisfactory results. However, they were considered too soft to be of value for shipping. Apricots, figs, pomegranates, Japanese plums, and olives yielded satisfactory crops. Citrus trees, however, suffered severe winter injury. Observations on an extensive collection of date varieties and seedlings showed certain varieties quite well adapted to the locality. However, due to the humidity during the ripening period, Deglet Noor variety gave poor results. Attempts to root detached date offshoots in manure, peat, sand, and earth, and under canvas shade gave unsatisfactory results. Much better success was attained with shoots attached to the parent tree. Studies in date pollination indicated that delay in applying pollen reduces the set. The highest percentage of fertilized flowers, 89.6, was obtained on a cluster pollinated the day it opened. Vinifera varieties of grapes gave excellent results. Pecans yielded high-grade nuts, but suffered from the adverse summer season.

In ornamentals, hybrid tea and climbing roses, oleander, and myrtle all grew satisfactorily. Among trees tested, Arizona cypress, Chinese elm, athel, and ironwood proved of value. Excellent results were obtained in nursery studies with pistache nut trees.

[Horticultural investigations at the New Mexico Station] (*New Mexico Sta. Rpt. 1925, pp. 28, 29, 31–36, 38–40*).—This is the usual annual report (E. S.

R., 53, p. 140). Open fruit blossoms were again badly injured by a late spring frost, occuring on April 3. Smudging averted serious injury in the peach and plum orchards. Modifications in the pruning practice from heavy to light treatment gave satisfactory results. Of several tomatoes, the Louisiana Pink proved a very good variety. Duty of water studies with grapes are briefly noted.

Yields obtained in the long continued cabbage fertilizer experiments were slightly lower in 1925 than in 1924. Yields on the commercial fertilizer plats showed a general increase, while those on the plats manured in 1921 showed signs of decline. Aphids were more numerous on the manured plats. The deleterious effect of large shade trees and a hedge upon yields was shown in a yield of 7,870 lbs. per acre for the shaded portion as compared with 23,220 lbs. for the rest of the field.

Pecans, by virtue of their late blooming habit, set a good crop of nuts in 1925, and some nuts were found on the English walnuts and almond trees.

Los Angeles Market lettuce sown August 26 and September 1 matured first-class heads, but failed to show any response to commercial fertilizers. Sweet peas sown September 30, though badly injured during the winter, yielded some fine blooms. Observations on the blooming habit of the Burrell Gem cantaloupe showed no marked tendency to produce a profitable crown set, and that crown blooms are largely male. Chile peppers gave excellent results.

Spring cauliflower in New Jersey, H. F. Huber (*New Jersey Stas. Bul. 432 (1926), pp. 16, figs. 10*).—In discussing the general cultural requirements of the spring cauliflower crop, the author emphasizes the need of high-quality seed, an abundance of available fertilizers, and the value of well-grown plants. Marked differences were recorded in the percentage of marketable heads in different seed stocks. As a result of the fertilizer tests, it was found that an application of 2,000 lbs. of 4-8-4 material was most effective. Manure alone was not so valuable as when supplemented with chemicals such as nitrate of soda. Plants grown in veneer bands yielded more first-grade heads than did those handled with less care.

Special circular of information for spraying for the season of 1926 (*New Jersey Stas. Circ. 198 (1926), pp. 4*).—A plan of treatment is suggested for controlling insects and diseases on the apple, peach, and grape which will at the same time leave the fruit free enough from spray residue to render it satisfactory for use.

The metabolic drift in apples: Biochemical changes, D. Haynes (In *Imperial Botanical Conference, London, 1924. Report of Proceedings. Cambridge: Univ. Press, 1925, pp. 22, 23*).—An abstract of the paper is presented.

Of the many chemical changes occurring in stored apples, loss of acidity is the most obvious. Acid is probably produced continuously by the oxidation of sugars, and, plotted against time in storage, acidity gives a logarithmic curve except in the case of overcooling, a condition which probably interferes with acid production. A definite relation was observed between acidity and nitrogen content in the Bramley Seedling, suggesting that high acidity is correlated with low protoplasm content. The proportion of total sugar changes very little during storage, although the proportion in which the different sugars occur alters significantly.

The drift of metabolism through senescence to death, F. F. Blackman (In *Imperial Botanical Conference, London, 1924. Report of Proceedings. Cambridge: Univ. Press, 1925, pp. 21, 22*).—An abstract of the paper is presented.

As recorded in intensity of respiration, there is a significant rise in metabolic activity in the apple during the transition from maturity to senescence. Three possible causes of alteration in metabolic activity are suggested, as follows: (1) Variation in the amount of effective catalyst in the cells, (2) variations in the concentration of the effective substrate, and (3) alterations of the physical organization of the protoplasm.

Longevity and variation of senescence rate among apples in storage, C. West (*In Imperial Botanical Conference, London, 1924. Report of Proceedings. Cambridge: Univ. Press, 1925, pp. 28–30, fig. 1*).—An abstract of the paper is presented.

Three factors, namely, temperature, composition of the storage atmosphere, and humidity, are believed to be concerned in retarding the ripening process in stored apples. Temperature is not always a successful agent, due to the onset of internal breakdown. An increase of carbon dioxide to 12 to 15 per cent and a decrease in oxygen to 5 to 8 per cent was found to lengthen materially the life of apples. The effect of humidity is not yet known. The author points out that other factors, such as the soil, season, and climate during growth in the orchard, also have a material effect upon the life of the fruit.

Fertilizer test for strawberries, B. Szymoniak (*Louisiana Stas. Rpt. 1925, pp. 52, 53*).—Of 21 different fertilizer combinations tested upon Klondike strawberry plants set in late November, 1924, that comprising 240 lbs. of nitrate of soda, 720 lbs. of acid phosphate, and 90 lbs. of sulfate of potash gave the highest yield of marketable fruit. Phosphoric acid was distinctly beneficial in increasing the size and firmness of berries and reducing the proportion of culls.

California's most important table grape varieties (*San Francisco: Calif. Grape Grower, 1925, pp. 31, figs. 16*).—Among the authors contributing to this pamphlet are L. O. Bonnet, F. T. Bioletti, and W. V. Cruess, all of the California Experiment Station.

Selection of planting stock for vineyards, F. T. Bioletti (*Hilgardia* [*California Sta.*], *2 (1926), No. 1, pp. 23, figs. 5*).—As a test of the value of selecting cuttings from productive vineyards, cuttings were taken from high- and low-producing vines in a block of 1,200 Muscat plants upon which individual records had been kept for five years. After careful grading, the rooted cuttings were planted on a uniform piece of land at Davis in such a manner that the vines of the highest-yielding parentage were directly contrasted with those of the lowest-yielding parentage.

In yield the first crop from the strongest 25 per cent was about 50 per cent greater than the first crop from the weakest 25 per cent. This difference was in part reversed in the second crop, and there was little difference in the third crop. Larger production in strong cuttings was associated with larger diameter increases of the trunk. The strong cuttings reached nearly full bearing in the third season, as compared with the fourth season for weaker cuttings.

No correlation was found between the crop of the parents and of the progeny vines. Mass selection on the basis of yield records had no perceptible effect. The average yield of vines from low-yielding parents was practically equal to that of the progeny of high-yielding parents, and showed the same variability. None of the nine highest-yielding progeny vines originated from the six highest-yielding parents. Conversely, none of the lowest-yielding vines originated from the five lowest-yielding parents. In conclusion, the author suggests that attempts to increase or perpetuate the productivity of grapevines by bud selection is undoubtedly a fruitless procedure.

Some responses of Vitis vinifera to pruning, A. J. Winkler (*Hilgardia* [*California Sta.*], *1 (1926), No. 20, pp. 525–543, figs. 6*).—To study the effect of

pruning on crop yield and growth of vine, and incidentally the effect of crops on vigor and yield, Muscat, Monukka, and Alicante Bouschet grapevines were treated in various ways, including the removal of none, part, and all of the fruit from unpruned vines and all and none of the fruit from normally and severely pruned vines. Fruit clusters were in all cases removed before the flowers opened.

Pruning exerted a depressing effect on circumference increase, total length growth, and production of leaves. The percentage of reducing substances and of starch in the dormant wood of 1-year-old vines was not altered by the omission of pruning. The retarding effect of cropping upon circumference gain was less than that of normal or severe pruning. In case of similarly pruned vines, the reduction was somewhat in proportion to the size of the crop. The nonpruned, part-crop and the nonpruned, all-crop Muscat vines produced from two to four times as much fruit, respectively, as the normally pruned, all-crop plants. These differences were greater in the case of Alicante Bouschet and less in Monukka.

With respect to quality of fruit, the nonpruned, part-crop vines produced grapes of normal sugar content, while the nonpruned, all-crop vines yielded fruit below average in sugar. The weight of the bunches of nonpruned, all-crop vines was only slightly less than that of bunches from the normally and severely pruned plants. Nonpruned, part-crop vines, in spite of their increased yield, yielded much the largest and most numerous berried clusters of any of the treatments. Nonpruned all-crop vines were next in rank.

An examination of the pollen of the plants of various fruits showed that pruning markedly decreased viability as compared with that of nonpruned, all-crop vines. Nonpruning coupled with thinning of the blossom clusters prior to blooming increased the germinability of the pollen.

Grapes in Oklahoma, F. B. Cross and L. F. Locke (*Oklahoma Sta. Circ. 62 (1926), pp. 31, figs. 11*).—In connection with the results of extended variety tests at Woodward and Stillwater, there is presented general information on grape growing in Oklahoma, including the locating and laying out of vineyards, planting, culture, trellising, pruning, spraying, renovation of old vineyards, etc.

The export of fresh grapes, F. de Castella (*Jour. Dept. Agr. Victoria, 24 (1926), No. 2, pp. 111–127, figs. 2*).—Of various vinifera grapes shipped from Victoria to England, the Ohanez (Malaga) was by far the best shipping variety. In storage investigations 32° F. was found to be the best temperature for keeping grapes. Observations upon a barrel of Spanish grapes shipped from London to Victoria indicated that the Spanish-grown fruit possesses better keeping qualities than that produced in Victoria. The author concludes that growing conditions, especially those pertaining to water supply, are more favorable in Spain.

The pecan in Texas, J. H. Burkett (*Texas Dept. Agr. Bul. 81 (1925), pp. 218, pls. 22, figs. 83*).—A revised and enlarged edition of a previously noted bulletin (E. S. R., 52, p. 642).

Vanilla, A. E. Collens and F. H. S. Warneford (*[Antigua, Leeward Isls.: Govt.], 1925, pp. 11, pl. 1*) —A discussion upon the culture, propagation, botany of the flower, need for artificial pollination, curing, etc.

Manual of floriculture, P. de Vilmorin (*Manuel de Floriculture. Paris: J.-B. Baillière & Sons, 1926, pp. VIII+416, figs. 324*).—This is prepared in three parts, the first devoted to general culture, the second to descriptions of plants and notes on their special requirements, and the third to selected lists arranged according to time of flowering, color, uses, etc.

A book of South African flowers, D. Barclay, H. M. L. Bolus, and E. J. Steer (*Cape Town: Specialty Press of So. Africa, 1925, pp. XVII+174, illus. 71*).—Illustrated in part in color and written in simple language, this book is designed to assist school children and others in identifying and appreciating the important South African flowers.

Aristocrats of the garden, E. H. Wilson (*Boston: Stratford Co., 1926, pp. XXV+312, pls. 26*).—With suggestions concerning the planting, pruning, and utilization of ornamentals in the prologue, the author discusses in the main part of the book a great number of ornamental plants, notably lilies, roses, flowering shrubs, climbers, and conifers, pointing out their singular beauties and their best uses.

The American rose annual, 1926, edited by J. H. McFarland (*Harrisburg, Pa.: Amer. Rose Soc., 1926, pp. 216, pls. 20, figs. 3*).—Conforming with the preceding edition (E. S. R., 53, p. 41), this, the eleventh in the series, contains pertinent articles on rose varieties, culture, and general activities at home and abroad.

A paper entitled After-Ripening and Germination of Rose Seeds, by W. Crocker (pp. 34–37), discusses work at the Boyce Thompson Institute for Plant Research, where it was found that 41° F. is the optimum temperature for stratifying rose seed. At this temperature the germination was greatly accelerated and the vigor of the seedlings increased. Granulated peat was found to be an excellent stratification medium, giving in many cases much better results than sand. The fact that rose seed germinated at 41° necessitates repeated examination of the stratifying boxes. A catalase test based on the power of the seed to decompose hydrogen peroxide is used to detect the progress of after-ripening.

A paper entitled Carrying on Dr. Van Fleet's Work, by B. Y. Morrison of the U. S. D. A. Bureau of Plant Industry (pp. 41–46), discusses the present status of rose breeding operations at the Horticultural Field Station at Bell, Md.

Annual flowers, I. Preston (*Canada Dept. Agr. Bul. 60, n. ser. (1926), pp. 51, figs. 36*).—Herein are presented popular cultural notes on species and varieties which have proved of value in Canada, together with lists of varieties for special purposes and districts.

Bulbs that bloom in the spring, T. A. Weston (*New York: A. T. De La Mare Co., 1926, pp. 144, pls. 8, figs. 59*).—Popular information is offered on varieties, culture, forcing, and planting arrangements.

Herbaceous borders for amateurs, R. V. G. Woolley (*London: Country Life, Ltd.; New York: Charles Scribner's Sons, 1926, pp. VII+118, pls. 15, figs. 3*).—General information is presented on the arrangement of herbaceous borders, the choice and care of plants, etc.

Around the year in the garden, F. F. Rockwell (*New York: Macmillan Co., 1926, 2. ed., rev., pp. XX+350, pls. 32, figs. 31*).—A revised edition of an earlier noted book (E. S. R., 38, p. 39).

Planting the roadside, F. L. Mulford (*U. S. Dept. Agr., Farmers' Bul. 1481 (1926), pp. II+36, figs. 41*).—Pointing out that ordinary rural highways can be rendered much more attractive by roadside plantings of trees and shrubs, the author discusses, with the aid of illustrations, the spacing and arrangement of roadside plantings, the best kinds of plants and trees to use, the planting and the care of the trees, etc. It is suggested that informal, natural arrangements are usually the most satisfactory. Care must be taken that plantings do not interfere with vision. Brief digests are given of the tree planting laws in the few States having such.

FORESTRY

The national forests of Idaho (*U. S. Dept. Agr., Misc. Circ. 61 (1926), pp. 34, figs. 13*).—This circular, prepared by the intermountain and northern districts of the Forest Service, presents information on the location, accessibility, and interesting features of the various national forests of Idaho, and outlines the policies of the Forest Service in developing grazing, lumbering, recreational, and other resources. Suggestions for preventing forest fires are set forth.

Trespass on national forests of Forest Service district 1, P. J. O'Brien (*U. S. Dept. Agr., Forest Serv., 1925, rev. ed., pp. VIII+88*).—A revised edition of a previously noted pamphlet (E. S. R., 49, p. 537).

The Rocky Mountain Forest Experiment Station (*U. S. Dept. Agr., Forest Serv., 1926, pp. 32, figs. 26*).—A popularly written discussion of the aims, policies, activities, and equipment of the Rocky Mountain Forest Experiment Station. In addition, descriptive notes are presented upon the most important forest species.

Progress report of forest research work in India for the year 1924–25 (*Forest Research Inst. Dehra Dun, Prog. Rpt., 1924–25, pp. [3]+120, pls. 5*).—This is the customary report (E. S. R., 53, p. 441) covering forestry investigations in the various provinces of India during the period cited, and including the administration report of the Forest Research Institute at Dehra Dun.

Of four methods, including soaking and scorching in burning leaves, tested in the United Provinces as a means of accelerating the germination of teak seed, scorching, when properly controlled, was the most successful operation. Soaking in water for 72 hours gave good results and was much safer.

Report of the Forestry Department, British Guiana, for the year 1925, B. R. Wood (*Brit. Guiana Forestry Dept. Rpt. 1925, pp. 12*).—This, the initial report of the newly created Forestry Department, discusses the present status of the forests and forest activities and outlines briefly a tentative forest policy.

Comparative growth in grazed and ungrazed woodlots at Purdue, B. N. Prentice (*Ind. Acad. Sci. Proc., 40 (1924), pp. 321–328, figs. 5*).—Records taken in comparable grazed and ungrazed areas of woodlots showed that grazing not only reduces the number of species and trees for a given space, but also diminishes the diameter and height growth of the trees. In the grazed area there were found only 30 per cent as much growing stock as in the ungrazed section, notwithstanding the similarity of the sites. The increment in the ungrazed area in 20 years was 300 per cent greater than that of the grazed section. There were over three times the number of trees under 6 in. in diameter at breast height on the ungrazed section.

Farm forest tree planting, A. A. Doppel (*Conn. Agr. Col. Ext. Bul. 96 (1926), pp. 15, figs. 2*).—Practical information is offered on the methods of planting and the cultural requirements of young forest trees.

Improved practices in the extraction of conifer seed [trans. title], Von Pentz (*Ztschr. Forst u. Jagdw., 58 (1926), No. 4, pp. 197–225, figs. 4*).—A discussion of various methods and factors involved in the harvesting, storing, and extracting of seed so that the viability may be preserved to a high degree.

Scotch pine in the Crimea [trans. title], E. B. Vul'f (Wulf) and E. M. Popova (*Trudy Leningrad. Obshch. Estest. (Trav. Soc. Nat. Leningrad), 55 (1925), No. 3, pp. 17–28*).—Scotch pines growing in the Crimea are characterized by the production of extra long, peculiarly shaped cones and by a very high-grade turpentine. The variation from the ordinary type of Scotch pine was

deemed sufficient to establish a subspecies, *Pinus silvestris hamata*. However, trees grown from seed obtained in northern Russia developed the same peculiarities upon reaching maturity, leading the authors to suggest that *hamata* is only an environmental variation and has no independent botanical status. Light intensity and the strong limestone soil are among the factors considered as influencing the characteristics.

Report on longevity of Hevea brasiliensis, F. G. Spring (*Trop. Agr. [Ceylon], 66 (1926), No 3, pp. 153–156*).—Observations on numerous plantations, some including trees in the vicinity of 30 years of age, showed that, in the absence of disease, soil neglect, and over-tapping, such trees were still in a productive, healthy condition, leading the author to suggest that there is no evidence to indicate that they had reached their maximum production.

Rubber production in Africa, H. N. Whitford and A. Anthony (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Trade Prom. Ser. 34 (1926), pp. VI+136, pl. 1*).—A compilation of information concerning the production of wild and cultivated rubber in Africa, where it is estimated that there are at the present time at least 38,000 acres of planted Hevea, capable of yielding upward of 5,000 tons of rubber annually.

DISEASES OF PLANTS

Outlines of fungi and plant diseases, F. T. Bennett (*London: Macmillan & Co., 1924, pp. XI+254, pls. 27*).—This book is intended for students and practitioners of agriculture and horticulture, more particularly those who must deal more or less fully with the subject of fungi and plant diseases. The subject matter in the first part serves as an introduction to study of fungi in general and as a basis for study of the second part, which deals solely with plant diseases and their causal fungi. The life histories of the organisms are described in the light of recent knowledge as set forth in literature which is not easily accessible to students.

[Control of some plant diseases in New Jersey] (*New Jersey Stas. Circs. 190 (1926), pp. 2; 191, pp. 2, fig. 1; 192, pp. 2, fig. 1; 193, pp. 2, fig. 1; 194, pp. 2; 195, pp. 2, fig. 1; 196, pp. 2; 197, p. 1*).—In the first of these circulars directions are given for the preparation of Bordeaux mixture. Popular descriptions, together with suggested means of control, are then presented for cherry leaf spot, potato blights, tomato leaf spot, melon blights, celery blights, maple leaf scorch, and horse-chestnut leaf blotch, respectively.

[Plant disease studies of the New Mexico Station] (*New Mexico Sta. Rpt. 1925, pp. 18, 19, 20, 29–31*).—In a further study of chili pepper wilt (E. S. R., 53, p. 146) the effect of irrigation on the moisture content of the soil and incidence of the disease was investigated, and only 1.9 per cent difference was noted in the moisture content of soils irrigated at intervals of 4 and 16 days. The least wilt and the highest yield of chili per plant was obtained on plats irrigated at intervals of 12 days.

Laboratory studies are said to have failed to reveal any organism associated with apple measles. Grafts of healthy Jonathan scions made on measled trees in 1924 have shown no evidence of disease. Cooperative work with the soils department of the station is said to indicate that trees grown in strongly alkali soils are more severely attacked than those in normal soils.

Texas root rot caused the destruction of considerable cotton in the Mesilla Valley, and it is said to be also destroying locust trees in the Pecos Valley. A Fusarium is said to cause a root rot of alfalfa in the Mesilla and Pecos Valleys.

Severe damage to pear trees by blight is reported, and the relation of weather conditions to the severity of the disease is pointed out.

[Plant pathology studies, Bombay Presidency], G. S. Kulkarni (*Bombay Dept. Agr. Ann. Rpt. 1922–23, pp. 167–171*).—The report of work done in the plant pathology section during the year 1922–23 includes a description and account of temperature relations of common potato rot fungi (*Fusarium* spp., *Sclerotium rolfsii*, and *Sclerotium* sp.), cotton wilt resistance studies (Broach Deshi No. 6 appearing immune), and onion leaf spot and blight (*Alternaria* sp.) as a root parasite, this being favored by heat and moisture, and variations of Goa and Nandore appearing to be resistant; control methods including selection, low seed rate, sodium nitrate at intervals, resistant varieties, and row method as preferable to bedding. Study of mango inflorescence blight associated with hoppers shows that a mildew is also present and at least in some cases causes the blight, also the dropping of tender fruits. Data have been collected on what is regarded as a group of mosaic diseases, regarding which no study has been done in India. "Katte" disease appears to be a typical case of the mosaic disease, which is also present in chili and tobacco crops. Severe mosaic occurred in *Raphanus sativus caudatus* at Poona. Alternaria was noted in wheat at the Ganeshkhind Botanical Gardens as attacking every part of the plant and lowering yield. Betel-vine wilt disease was more serious in the intensive cultivations at Savanur. A Fusarium is always present on the roots of the wilted plants. *Aloe vera* rust (*Uromyces aloes*) has been worked out as to its life history. *Eleusine coracana* smut (*Ustilago eleusines*) does not appear to be seed-borne. Plant diseases not previously recorded for the Presidency include *Alternaria* sp. on wheat. *Helminthosporium* sp. on tobacco, and *Acrothecium* sp. on sorghum.

Plant chlorosis [trans. title], L. Leroux (*Rev. Gén. Sci., 36 (1925), No. 14, pp. 418–420*).—Conditions, phases, and remedies are indicated in a brief historical and bibliographical account dealing with plant chlorosis, chiefly in southwest Europe.

Verticillium-wilt of herbaceous and woody plants, J. H. H. van der Meer (*Meded. Landbouwhoogesch. Wageningen, 28 [1925], No. 2, pp. [4]+82, pls. 15, figs. 9*).—Verticillium wilt is dealt with in several chapters of this contribution as regards diagnosis, pathogenicity, host range, taxonomy, cherry tree verticilliosis, cross-inoculations, ecology, and control, including measures classed as preventive, cultural, sterilization, and disease-resistant. Citations of related literature include about 70 references.

Toxicity of organic compounds to the spores of Phytophthora colocasiae Rac., B. N. Uppal (*Jour. Agr. Research [U. S.], 32 (1926), No. 11, pp. 1069–1097*).—An investigation was made of the effect of a considerable number of alcohols, aldehydes, and organic acids on the spores of *P. colocasiae* to learn the group or radical in aldehydes and alcohols to which toxicity can be attributed.

The results of the study on the toxicity of the aliphatic alcohols are said to substantiate Richardson's law, which states that the toxicity of the normal aliphatic alcohols increases with molecular weight.

The toxicity of aldehydes is considered to be due mostly to the aldehyde group which they contain, and the aromatic or the aliphatic nature of a radical to which the aldehyde group is united seemed to have very little influence on their toxicity.

The results obtained on the toxicity of organic acids are said to signify that the electrolytic dissociation of an organic acid is not always an index of its physiological action, for in these acids the undissociated molecules and the anions had a distinct toxic action of their own.

Take-all of wheat and similar diseases of cereals, W. M. Carne and J. G. C. Campbell (*West. Aust. Dept. Agr. Bul. 119 (1924), pp. 10*).—Take-all (*Ophi-*

obolus cariocti, O. graminis) affects wheat principally, but also rye, barley, and grasses, very rarely oats. The disease may occur on old, new, fallowed, or unfallowed land. It may be distinguished by a dark felted growth at the stem base. Infection is carried by wind and by animals.

Farming practice is adequate to produce good crop results and to control take-all if it includes burning of stubble, early fallowing, clean fallows and good seed bed, wet sowing with use of superphosphate, and rotation with oats or other crops not susceptible.

Loose smut of wheat, W. E. BRENTZEL (*North Dakota Sta. Circ. 29 (1926), pp. 3–11, figs. 6*).—A popular description is given of the loose smut of wheat, and the hot water treatment for its control is described. The author especially advocates this treatment in connection with wheat improvement and seed production.

Treatment for smut, C. C. GEORGESON (*Alaska Stas. Rpt. 1924, pp. 18–20*).—In an experiment for the control of smut in oats the formaldehyde treatment gave the lowest proportion of smut in the plats, followed by Uspulun and copper carbonate. The other treatments did not reduce smut to any considerable degree.

For the control of barley smut the most successful treatment was with copper carbonate (3 oz. per bushel), followed by Uspulun and hot water treatment. The hot water treatment is said to have caused considerable loss of vitality in the seed, and the stand was lower than in the other plats. Formaldehyde also resulted in a lessened viability, a slightly less vigorous growth, and slower ripening of the grain.

Protection of grain crop demands barberry eradication, G. C. CURRAN and B. KOEHLER (*Illinois Sta. Circ. 308 (1926), pp. 12, pl. 1, figs. 6*).—The relation of the barberry to wheat rust is described, and the authors recommend the destruction of barberry bushes by the application of crushed rock salt.

A method of growing corn seedlings (Zea mays) free from seed-borne organisms, W. D. VALLEAU and E. M. JOHNSON (*Jour. Agr. Research [U. S.], 32 (1926), No. 12, pp. 1195–1198, figs. 3*).—The authors describe a method by which corn seedlings can be grown for investigations on the pathogenicity of organisms associated with corn seeds and rotting roots, the seminal roots and seeds being removed from the seedlings at an early stage of development.

Experiments in cotton root-rot control, C. J. KING and A. R. LEDING (*U. S. Dept. Agr., Dept. Circ. 372 (1926), pp. 9, 10*).—Experiments in progress from 1920 to 1924, in which manure and alfalfa were added to spots where cotton had been killed by root rot, are said to have shown a reduction in the extent of the infected areas where organic materials were applied, and the reduction was maintained during the succeeding years.

Formaldehyde solution applied to diseased areas is reported to reduce the amount of disease, but it is considered to offer little hope as a control measure except where small isolated spots of infection occur on a valuable piece of land.

Biological cause of flax soil fatigue [trans. title], A. N. KLECHETOV (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 1 (1924), No. 7–8, pp. 511–521, figs. 7*).—Studies conducted at the Moscow Agricultural Academy are reported, from which the conclusion is drawn that the continued growing of flax and apparently the frequent repetition of flax growing on the same soil result in a gradual increase of parasites, which eventually produces the condition known as soil fatigue and makes flax growing impossible. Apparently an entire series of organisms is active in producing this condition.

Potato diseases [trans. title], E. Baudyš and J. Říha ([*Czechoslovakia*] *Min. Zemědĕl., Sborn. Výzkumn. Úst. Zemědĕl. No. 4 (1924), pp. 39, figs. 7*).— A review of potato disease treatments includes formalin, mercuric chloride, Bordeaux mixture, Germisan, and Uspulun, most of which lower germinability.

Principal diseases of potato in Java [trans. title], P. van der Goot (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Inst. Plantenziekten Bul. 18 (1924), pp. 44, pls. 11*).—A list with brief descriptive and other information of causes lowering potato returns in Java includes animals (insects, nematodes), fungi, and bacteria.

Leaf-roll and mosaic, two important diseases of the potato (*Ireland Dept. Agr. and Tech. Instr., Spec. Leaflet 24 [1923], pp. 4, pls. 2*).—It is stated that though the attention of potato growers of Ireland has but recently been directed to leaf-roll and mosaic there is evidence that these two diseases have long been present in that country, as elsewhere, effects similar to those now regarded as characteristic of these diseases having been "recognized 150 years ago, three-quarters of a century before blight appeared. In those days the trouble was generally referred to as 'Curl.' This name appears to have been applied to a group of several allied diseases, of which it is now impossible to tell the predominant one, although leaf roll and mosaic were probably among the most important." Discussion is given of the diseases, their supposed nature, transmission, and control. They do not persist in the soil in the absence of a potato crop. Direct control of insect carriers is not yet practicable, but avoidance of inclosed shady or weedy places will help. No varieties are immune, but some are comparatively resistant. Seed stock crops should be kept isolated.

[**Potato scab control in Alaska**], C. C. Georgeson (*Alaska Stas. Rpt. 1924, p. 5*).—The control of potato scab by treating the seed tubers with a formaldehyde solution, 1 pint to 10 gal. of water, is reported.

The spindle-tuber disease as a factor in seed potato production, H. O. Werner (*Nebraska Sta. Research Bul. 32 (1926), pp. 4-128, figs. 34*).—The results are given of a study of spindle-tuber disease of plants of potatoes, which is considered to be a degeneration or virus disease and believed to be the cause of much running out of seed potatoes in all parts of the State. The general low average per acre yield in irrigated regions is attributed by the author to the prevalence of this disease, and it is held to be the leading factor causing fields to be rejected for certification during the past few seasons.

The characteristic symptoms of the disease are described at length. No instances of varietal resistance or immunity have been found. Roguing and seed selection are claimed to reduce the percentage of the disease in certified stock, while tuber line selection has proved valueless in improving the stock.

Spindle tuber is said to spread rapidly in irrigated culture and is retarded in dry land culture. Mulching about the plants with straw in eastern Nebraska resulted in the production of seed tubers, the progeny of which showed less disease and that of a milder type. Late planting is said to have reduced the percentage of spindle tuber in both rogued and unrogued plats. It is claimed that the disease may be transmitted by tuber grafts as well as by exposing healthy plants to infection. The transmitting agency has not yet been determined.

Seed selection of the best type of tubers from an infected lot was ineffective in maintaining a seed strain. Early and frequent roguing proved an effective method of controlling the disease where there was only a small percentage of infection. The tuber-index method was not found an effective means of control.

The author recommends the selection of a strain entirely or practically free from spindle tuber and then growing it in an isolated and severely rogued seed plat as the best control method known at the present time.

Potato wilt and its control, M. B. McKay (*Oregon Sta. Bul. 221 (1926), pp. 23, figs. 13*).—Wilt of potatoes caused by *Verticillium alboatrum* and *Fusarium oxysporum* is said to be important in Oregon. After describing the effect of wilt on the different parts of the potato plant it is shown that the wilt-producing organisms are carried in tubers from diseased hills and where used for seed the next year readily give rise to disease, particularly in the case of those infected by Verticillium. The presence of discoloration in the stem-end vascular region of potato tubers is not considered a trustworthy index of the presence of disease-producing organisms therein, and can not be used exclusively as a guide for the separation of diseased from healthy tubers for planting purposes. Stem-end seed pieces did not give more disease either in the plants or in the tubers produced therefrom than the eye-end seed pieces of the same infected tubers. The use of whole seed potatoes for avoiding infection by Fusarium from the soil is considered to be of some value in those areas where this disease is a serious factor, since infection of the plants by this fungus often occurs through the cut seed piece. The use of whole seed to avoid Verticillium wilt would be without value because this fungus enters the plants from the soil through the roots and apparently never enters through the seed piece. Potato plants contaminated from the adjoining wilt-disease plants usually do not show visible wilt symptoms in the field, probably because of late infection. For this reason effective control of the disease can not be secured by the roguing of only the visibly wilted plants. The author recommends roguing by the 3-plant method for the effective control of Verticillium wilt, that is, the removal of the visibly infected plant and the next healthy plant on either side in the same row.

Potato wilt is said to live over winter in old tops in the soil and very readily causes disease in wilt-free potatoes planted therein. Rotation experiments showed that a 2-year rotation was ineffective for avoiding Verticillium infection, but 3- and 4-year rotations are considered completely effective in eliminating this fungus from the soil.

Of 12 potato varieties tested, none seemed to possess any appreciable resistance to Verticillium wilt.

The comparative susceptibility of sweet-potato varieties to black rot, L. L. Harter, J. L. Weimer, and J. I. Lauritzen (*Jour. Agr. Research* [*U. S.*], *32 (1926), No. 12, pp. 1135–1142*).—Twenty-one varieties of sweet potatoes were tested under field conditions for a period of four years to determine their resistance or susceptibility to black rot, caused by *Ceratostomella fimbriata*. It was found that although a large percentage of the plants may be diseased when set in the field, the number of black-rot sweet potatoes at harvest time may be relatively small. Ten days to two weeks after setting the plants in the field a large percentage was found to be diseased, but frequently the potatoes when dug did not show the presence of black rot, although they were grown on black-rot plants. When stored immediately after harvesting under conditions favorable for the development of black rot the disease developed abundantly on all varieties. The authors' experiments are believed to indicate that none of the varieties included in the experiments were immune to black rot. A variety showing a relatively low percentage of infection one year may be badly diseased the next.

Influence of soil temperature and soil moisture on the infection of sweet potatoes by the black-rot fungus, L. L. Harter and W. A. Whitney (*Jour. Agr. Research* [*U. S.*], *32 (1926), No. 12, pp. 1153–1160, figs. 2*).—Series

of experiments were conducted to determine the relation of soil temperature and soil moisture to infection of sweet potatoes by the black-rot fungus, *Ceratostomella fimbriata*. The optimum temperature for the disease was found to be about 25° C. (77° F.). Some infection occurred at a temperature of 10°, but none at 35°. At temperatures between 15 and 30° all plants became diseased.

Soil moisture was found to exercise considerable influence on the amount of disease, the amount increasing with the increase in the percentage of the water-holding capacity of the soil up to about 60 per cent, and then decreasing. There was some infection in a saturated soil, and it was found that infection took place at a moisture content of the soil as low as that at which the plant would grow. Wounding is not considered necessary to infection, inasmuch as 48.2 per cent of the sprouts from potatoes dipped in a spore suspension of the organism and then bedded became diseased.

Observations on the growth of control plants showed that at 10° the sweet potato plants slowly died, and at 15° no growth took place. The optimum for growth appeared to be at about 35°, although there was a good growth at 38°.

Cultural methods for reducing sweet potato losses caused by stem rot, R. F. Poole (*New Jersey Stas. Bul. 433 (1926), pp. 16, figs. 9*).—It is claimed that besides the success obtained in the control of stem rot or wilt of sweet potatoes caused by *Fusarium batatatis* and *F. hyperoxysporium* with the use of resistant varieties such as Red Brazil, Yellow Yam, White Yam, and Triumph, the use of two or three plants per hill proved to be a very economical method of reducing losses from this disease. When three plants were grown in a hill, stem rot was found to kill one or more of them, but rarely all three, indicating that the disease is only slightly, if at all, contagious during the severe infective period of July and August. When a large percentage of single plants were killed, the use of two or three plants gave from 30 to 50 per cent greater production, because a good stand was maintained. Two or three plants in a hill did not decrease the yield even when all plants remained in the hill throughout the season, and on fertile soils they gave an increased production.

The author claims that the results of his investigations suggest the use of two plants on soils slightly infected with the wilt fungi and three plants on severely infected ones. There is said to be a further advantage if the most resistant strains of Jersey varieties are used, and if healthy seed stock is used for growing the sprouts.

Field studies of sugar-beet nematode, G. Stewart and A. H. Bateman (*Utah Sta. Bul. 195 (1926), pp. 3–32, figs. 9*).—The results are given of a study of the sugar-beet nematode as a factor in sugar-beet production in Utah. A survey of a number of areas that are known to be severely infested showed that when present in abundance the nematode is highly destructive of sugar beets, both as to yield and as to sugar content. Various agronomic methods of growing sugar beets, such as fall plowing, thorough preparation of the seed bed, numerous cultivations, the addition of farm manure and of chemical fertilizer, irrigation, rotation, etc., were investigated, but none of the practices except crop rotation had any significant effect on the yields of beets on severely infested land.

Histology and cytology of sugar cane mosaic, M. T. Cook (*Jour. Dept. Agr. Porto Rico, 9 (1925), No. 1, pp. 5–27, figs. 58*).—The studies here recorded were undertaken to show the histological and cytological differences between healthy and mosaic plants and to seek the cause of sugar cane mosaic. A review is given of the literature bearing directly on this phase of mosaic.

The symptoms of mosaic are more conspicuous on actively growing than on slow growing plants, and on new than on old leaves of a given plant. The light areas are slightly thinner and somewhat reduced in size, the green areas corresponding in every way to leaf parts from healthy plants of like variety and age. Intracellular bodies, though difficult to find, corresponded to those reported by Kunkel (E. S. R., 51, p. 449). Host nuclei were much enlarged in diseased tissue (especially in leaves) and very irregular in form. Chloroplasts were fewer and smaller in the mosaic tissues. The internal cavities, in both stems and leaves, start cell-wall disintegration.

Soil reaction and black root-rot of tobacco, P. J. Anderson, A. V. Osmun, and W. L. Doran (*Massachusetts Sta. Bul. 229 (1926), pp. 117–136, fig. 1*).—In connection with attempts to control black root rot of tobacco, five years' experimentation was conducted to determine the effect the application of lime may have on the growth of tobacco in the absence of root rot, the relation between severity of infection and acidity as measured by H-ion concentration, and the effect of a timothy cover crop on the yield and quality of tobacco and on the severity of root rot.

The immediate effect of liming an acid soil was found to be an increase in yield of tobacco, but if sufficient lime was added, black root rot was ultimately promoted, with a consequent reduction in yield. The fungus, *Thielavia basicola*, is said to be present in most soils but is more injurious in nearly neutral soils by reason of more rapid and vigorous growth of the fungus in a nearly neutral medium.

Under field conditions black root rot is said to cause little or no loss in soils more acid than pH 5.6, but it caused severe losses on all soils less acid than pH 5.9. As the soil became less acid above pH 5.9 the loss from black root rot was found to increase, but the upper limit of alkalinity was not determined. After repeated applications of lime had brought the soil reaction to a point favorable to the fungus, the omission of lime for two years, with tobacco grown continuously meanwhile, did not result in any immediate reduction in the severity of the disease. Where the application of lime is considered necessary the authors recommend that it should be added in small applications and with great caution, always preceded by determinations of soil reaction to avoid approaching too closely to conditions favorable for the fungus.

The use of a timothy cover crop was found to have no significant effect on the prevalence of black root rot, although the yield of tobacco was reduced for three consecutive years. This effect is said to be associated with brown root rot. When the timothy cover crop was omitted for one year, the depressing effect of timothy was found to disappear quickly and to be replaced by a beneficial effect. In the authors' experiments the yield on plats so treated exceeded by 17 per cent those without a cover crop.

Tomato wilt investigations, R. P. White (*Kansas Sta. Tech. Bul. 20 (1926), pp. 4–32, figs. 17*).—A description is given of tomato wilt caused by *Fusarium lycopersici*. In a test of 29 varieties for wilt resistance, the majority proved susceptible, although they had been described as resistant. Six varieties introduced for trial purposes and one developed at the station proved wilt resistant, commercially desirable, and climatically adapted to Kansas. They are Louisiana Red, Louisiana Pink, Marvel, Norton, Norduke, Marvana, and Kanora. For the home garden, Marvel, Louisiana Red, Norton, and Kanora are recommended.

The author claims that varieties classed as resistant may prove to be somewhat susceptible when grown under certain other environmental conditions.

Physiological dropping of fruits, L. R. DETJEN (*Delaware Sta. Bul. 143 (1926), pp. 5–47, pls. 5, figs. 7*).—An account is given of an investigation of plums, peaches, and apples to determine the relative importance of pollination, fertilization, and embryo abortion to abscission in fruits. From the results obtained in his investigations, the author reports that in favorable seasons, under mixed variety orchard conditions and with compatible varieties, the dropping of immature fruits, usually referred to as physiological drop, can not be attributed to a lack of either pollination or fertilization. Under the above mentioned conditions undetermined factors are assumed to cause embryo abortion, and this appears to be the chief cause of the dropping of immature fruits. There is said to be clear evidence of a lack of fertilization in the ovules of the earlier drops, but the total number so affected is relatively small except in cases where hybrid varieties with abnormal flowers are involved. Fruits whose ovules have not been fertilized are generally shed soon after the blooming period.

A lack of pollination and a lack of fertilization, which are commonly supposed to be the chief causes for the shedding of young fruits, are considered by the author to be factors of but minor importance. The author concludes that under the conditions of his investigations the factors that bring about embryo abortion appear to be the chief cause for the shedding of the majority of young fruits.

Frost injury to the apple, F. S. HOWLETT (*Ohio Sta. Bimo. Bul., 11 (1926), No. 3, pp. 104–109, figs. 6*).—A discussion is given of the relation of frost injury to the dropping of fruits. Ordinarily two periods of dropping are said to occur, but following a frost on May 24–25, 1925, a third was noted. From a study of partially developed fruits, in which no discoloration of the seeds or of the flesh was observed, many were found in the second and third drops to have fallen as a result of frost injury. Fruits with only the flesh injured did not fall in a very great number of instances. Occasionally, despite the killing of seeds on one side of the fruit, development continued, resulting in many malformed fruits at maturity. It is said that many fruits which made additional growth after the frost had been injured and eventually fell as a result.

Apple fruit-spot, C. J. HOPKINS (*Union So. Africa Dept. Agr. Jour., 11 (1925), No. 4, pp. 366–370, figs. 4*).—Apples sent in from a Transvaal orchard showed a fruit spot associated with a fungus conforming in cultural and microscopical characters to *Phoma pomi* (*Cylindrosporium pomi*).

Preference is given to midsummer spraying unless the trees have already been sprayed for scab, in which case a late December or early January spraying will suffice. Lime sulfur is preferred, as less liable to damage the fruit than is Bordeaux, which, however, is effective when made up of copper sulfate 3 lbs., quicklime 3 lbs., and water 50 gal.

Brown heart in Australian apple shipments, A. J. SMITH and F. S. STUDENT (*[Gt. Brit.] Dept. Sci. and Indus. Research, Food Invest. Bd. Spec. Rpt. 22 (1925), pp. V+28, pls. 11*).—The work described in this report (the third on the Australian Expedition, 1923) is said to have supplemented and continued the laboratory studies carried out at the Low Temperature Station, Cambridge, the results of which were separately published and have been noted (E. S. R., 50, p. 449). The several sections of the present report deal with treatment of the fruit prior to shipment, conditions of shipment in holds not forcibly ventilated, artificial production of brown heart due to restricted ventilation, examination of shipments on arrival in England, and conclusions (in some detail).

The available evidence indicates conclusively that brown heart in Australian apple shipments results from an accumulation of carbon dioxide in the presence of a certain amount of oxygen in the atmosphere of the hold. No sign of brown rot was found on careful examination prior to shipment, nor did the treatment of the fruit before shipment warrant expectation of its appearance. No marked correlation of brown rot with temperature at time of loading could be made out.

Observations made throughout the voyage showed the danger of a certain accumulation of carbon dioxide in holds not afforded forced ventilation. The safety limit of 10 per cent was reached at the end of the first fortnight, and an excessive value, 13 per cent, by the end of the voyage in one hold. Holds with more than 15 per cent carbon dioxide show the disease without exception, holds with less carbon dioxide showing the disease occasionally.

By restricting ventilation brown rot has been produced in 10 common Australian varieties at the temperature of the ship's hold, and this increases with the carbon dioxide content.

It is emphasized that orchard conditions and such inherent factors as the varietal nature of the fruit and its degree of maturity may have important effects in governing the susceptibility to the disease, although the stndy of these factors has not yet been seriously taken up.

Cankers of apple and pear in Oregon and their control, S. M. Zeller (*Oregon Sta. Circ. 73 (1926), pp. 29, figs. 29*).—A key is given by which the 10 kinds of cankers occurring in Oregon may be recognized. Each form is popularly described and suggestions given for its control.

European canker of pomaceous fruit trees, S. M. Zeller (*Oregon Sta. Bul. 222 (1926), pp. 5–52, figs. 24*).—A description is given of European canker of apple and pear trees, witb particular references to conditions found in western Oregon, and the life history of the causal organism (*Nectria galligena*) is briefly discussed. The author's studies are said to show that the macroconidia are liberated from the time the first rains fall in the autumn until December or early in January, according to weather conditions, and then again from early spring until the close of the rainy period in late spring. Ascospores were found to be discharged during a period extending from approximately 90 days after the autumnal rains begin until the rains stop in late spring. Under natural conditions infection was found to take place during any part of the rainy months, but the majority of infections occurred in the fall and spring, principally during the fall months. A majority of the infections were found to take place through fresh leaf scars, but such wounds as pruning cuts, broken twigs, winter-injury cankers, or cracks and lesions produced by woolly aphis become infection courts.

For the control of European canker the author recommends one application of Bordeaux mixture 4–4–50 as late as practicable. Eradication measures consist of orchard sanitation and the elimination of diseased tissues from cankers or the complete removal of cankered branches. It is suggested that the larger wounds be treated with Bordeaux paint made up by stirring raw linseed oil into powdered Bordeaux.

Red scale and Fusicladium control in pear orchards, F. W. Pettey (*Union So. Africa Dept. Agr. Jour., 11 (1925), No. 4, pp. 351–356*).—An account is given of orchard spray experiments at Elsenburg during 1923–24, with references to reports on related or similar work as far back as 1920–21.

Peach disease conditions in Ohio, L. R. Hesler (*Ohio Sta. Bimo. Bul., 11 (1926), No. 3, pp. 110–114*).—The author reports that a heightened interest in peach growing has led to the adoption of the usually recommended practices of

pruning, fertilizing, cultivating, and spraying, and that certain abuses have accompanied the adoption of these practices. In pruning, carelessness should be avoided so that no long stubs remain or open wounds through which fungi may enter and cause canker. In some cases excessive cultivation and fertilization are said to contribute toward the heavy winter injury prevalent in Ohio peach orchards. Injudicious use of lead arsenate as a spray has resulted in a great deal of injury not only to foliage but to the twigs.

The question of nuclear fusions in the blackberry rust, Caeoma nitens, B. O. Dodge and L. O. Gaiser (*Jour. Agr. Research* [*U. S.*], *32* (*1926*), *No. 11, pp. 1003–1024, pls. 4*).—A study was made of the behavior of the nuclei during spore formation and germination of *C. nitens* as an explanation of the possibility of the production of hybrid forms of this parasite. In neither the binucleate nor the multinucleate forms was fusion observed, and the authors claim that the formation of a hybrid between a short-cycle strain whose spores are uninucleate and a short-cycle strain with binucleate spores would not be expected to lead to the development of a new form of the rust.

Growth of Botrytis on strawberries under refrigeration, N. Stevens and L. A. Hawkins (*Ice and Refrig., 69* (*1925*), *No. 6, pp. 375, 376, fig. 1*).—The statement formerly made by Stevens and Wilcox (E. S. R., 39, p. 543) that most strawberries attacked by Botrytis can be detected and should be removed when the berries are packed apparently does not hold under such conditions as those obtaining in the work here dealt with. That the spread of Botrytis in the field is favored by abundant moisture and temperatures too low for many other fungi was indicated in other work previously reported (E. S. R., 50, p. 48).

The present notes show that gray mold (*B. cinerea*) can grow to some extent on strawberries under very good refrigeration. In general, the growth and spread of Botrytis is favored by wet, cool weather, so that under such conditions this fungus may become abundant on strawberries before its presence is indicated by any considerable amount of field rot.

"In an experimental shipment consisting of three carloads of strawberries, one of which contained only two layers of crates loaded tightly, another three layers of crates loaded with air spaces beside each crate, and the third three layers loaded tightly, the berries in the second layer of the last-mentioned car showed less mold and were in a better condition than the corresponding layers of either of the other cars. It is suggested that an accumulation of small amounts of carbon dioxide in the middle layer of the tightly loaded car may have some relation to this phenomenon."

Leaf scorch disease of strawberries, F. A. Wolf (*North Carolina Sta. Tech. Bul. 28* (*1926*), *pp. 16, figs. 22*).—The results are given of an investigation of the cause and control of the leaf scorch of strawberries due to *Diplocarpon earliana*. Technical studies of the fungus have been previously noted (E. S. R., 53, p. 754).

Wide differences were observed in the susceptibility of varieties to the disease, and the planting of immune or resistant varieties and spraying the plants with Bordeaux mixture are suggested as means of control.

Ripe rots of grapes and the acetates of copper as non-staining sprays for late applications to control them, A. S. Rhoads (*Fla. State Hort. Soc. Proc., 37* (*1924*), *pp. 154–159*).—Though grape ripe rots cause comparatively little loss during dry years, yet where wet weather prevails during the ripening season, as is often the case in Florida, considerable damage may occur. The principal fungi commonly causing grape ripe rots are for bitter rot *Melanconium fuligineum*, for white rot *Coniothyrium diplodiella*, and for a rot corresponding to apple bitter rot and ripe rot of several other fruits, the same fungus,

Glomerella cingulata. Bitter rot and white rot are the more important, as they may attack the cluster, stem, or branches, or the berry stalks before the berries are infected. The ripe rot fungi unfortunately attack the grape crop when spray control is no longer applied for black rot, anthracnose, and some other diseases, and when Bordeaux mixture is no longer desirable on account of the unattractive residues left on the fruits, if applied within a month of harvesting for market. The acetates of copper (basic, and neutral or normal) are considered in this connection. Both contain high percentages of copper, the active fungicidal agent. It is stated that despite the greater cost of copper acetates as compared with copper sulfate, the basic copper acetate at least is not prohibitive in price when its value for a single application to the ripening grapes is considered.

The possible relationship of die-back to fasciation in other plants, T. J. Harris (*Fla. State Hort. Soc. Proc., 37 (1924), pp. 130–135*).—The author presents facts and reasons in support of his claims that a close resemblance exists between the symptoms of die-back in citrus and those exhibited by other plants affected by fasciation, and that the matters observed may have or may assume economic importance, as in the cases of strawberry and pineapple.

Commercial control of citrus melanose in Florida in 1923, J. R. Winston (*Fla. State Hort. Soc. Proc., 37 (1924), pp. 127–129*).—Experimental tests in parts of Florida have indicated consistently that citrus melanose can be practically prevented by a single application of Bordeaux mixture if made before the beginning of the May rains.

In 1922, after preliminary trials, satisfactory results in control of melanose were obtained by spraying with Bordeaux oil emulsion, and results as good followed a greater number of trials in 1923, which were also more favorable for early infection. Usually little infection develops in March, somewhat more in April, but in May infection of commercial importance is liable to occur before the fruit is old enough to become immune to the disease. Six arbitrary melanose grades are indicated as used in estimating the success of control measures. The differences are strongly in favor of the policy of spraying. In general the most effective spraying in 1923 was done just before the May rains set in. This appears to have been a good test, and the one-spraying plan appears to be safe if carried out just before the early May rain and outbreak.

Maple wilt, G. F. Gravatt (*U. S. Dept. Agr., Dept. Circ. 382 (1926), pp. 14, figs. 9*).—A description is given of maple wilt caused by *Verticillium* sp., which is said to occur from North Carolina and Tennessee to Canada and westward to Wisconsin. A number of species of maple are attacked, but the wilt is said to be most destructive to Norway and sugar maples. The fungus gains entrance to healthy trees through wounds, and the suggested treatment consists of sanitary measures, such as cutting out and burning infected parts and the protection of wounds.

ECONOMIC ZOOLOGY—ENTOMOLOGY

A list of the publications of Albert Kenrick Fisher, T. S. Palmer and W. L. McAtee (*Biol. Soc. Wash. Proc., 39 (1926), pp. 21–28*).—This list of the writings of A. K. Fisher, largely on ornithology, covers a period of 50 years, from October, 1875, to January, 1925.

Jack rabbits of Colorado, with suggestions for their control, W. L. Burnett (*Colo. State Ent. Circ. 48 (1925), pp. 11, fig. 1*).—Brief descriptions are given of the four forms of jack rabbits occurring in Colorado.

Experimental work with poison was conducted with the black-tailed and white-tailed species of the plains region of the northeastern part of the State. The author finds that rabbits can not be poisoned as economically as prairie dogs or ground squirrels, but that they can be poisoned at a cost that is negligible compared with the amount of damage they do to crops when present in large numbers. The work led to the conclusion that jack rabbits can be successfully poisoned at all seasons of the year, but with the best results in the winter. Formulas are given, with directions for their use at different seasons of the year.

Construction and operation of Biological Survey beaver trap, V. BAILEY (*U. S. Dept. Agr., Misc. Circ. 69 (1926), pp. 4, figs. 2*).—Practical information is given regarding this trap, designed chiefly for capturing beavers alive for control and propagation.

Sixteenth annual report of the State entomologist of Colorado, C. P. GILLETTE, G. M. LIST, ET AL. (*Colo. State Ent. Circ. 47 (1925), pp. 77, figs. 14*).—Included in this report are Notes on Insect Pests (pp. 12–18); Peach Tree Fumigation, by G. M. List and W. P. Yetter, jr. (p. 18); The Alfalfa Weevil, *Phytonomus posticus* (Gyll.) (Progress Report for 1924), by J. H. Newton (pp. 18–21); Grasshopper Control in Colorado (pp. 21–24) and Notes on the False Chinch Bug, *Nysius ericae* Schill. (pp. 24, 25), both by G. S. Langford; The Oyster-Shell Scale, *Lepidosaphes ulmi* L., by G. M. List (pp. 25–31); The Codling Moth, *Carpocapsa pomonella* L. (p. 31); Codling Moth Work in Mesa County, by W. P. Yetter, jr. (pp. 32–40); Codling Moth Work in Delta and Montrose Counties, by J. H. Newton (pp. 40–42); The Fruit-Tree Leaf Roller, *Archips argyrospila* Wlk., by J. H. Newton (pp. 42, 43); The Mexican Bean Beetle, *Epilachna corrupta* Muls., by G. M. List (pp. 43–55), which supplements the account previously noted (E. S. R., 47, p. 56); The Danger to Humans from the Poison on Sprayed Beans (pp. 56, 57); Alfalfa Nematode Investigations, by C. P. Gillette (pp. 58–60); Report on the Outbreak of *Tylenchus dipsaci* Kuhn in Colorado and Utah in 1924, by G. Thorne (pp. 61–70); Notes on Poisoning Rodent Pests, by W. L. Burnett (pp. 70–72); and Apiary Inspection, by R. G. Richmond (pp. 72–74).

[Entomological work at the Louisiana Stations], W. E. HINDS, H. SPENCER, S. JACKSON, and J. M. JENKINS (*Louisiana Stas. Rpt. 1925, pp. 19–27, 51, fig. 1*).—In hibernation studies of the boll weevil only 1 of 1,956 weevils placed in cages between October 4 and 15, 1924, emerged the following spring (on May 15). Practically 9 per cent of the 5,370 weevils placed in cages from October 31 to November 29 survived, emerging from hibernation from February 15 to June 12. In insecticide control work, the average net increase in yield in dusted plats amounted to 523.5 lbs. of seed cotton per acre, or two-thirds of the total yield secured without the use of poison. The average number of dust applications was 7, with a range of from 5 to 10. The dosage of calcium arsenate applied averaged approximately 6.5 lbs., or 45 lbs. per acre as the total for the season, the cost being approximately 9 cts. per pound. Reference is made to the application of calcium arsenate to cotton for weevil control by means of airplanes in a commercial way and upon a large scale in Louisiana for the first time in 1925.

In cotton plant louse control work it was found that, when the pest threatened to become serious, an immediate application of a combination of 0.5 lb. of nicotine sulfate (40 per cent nicotine), with 8 lbs. of calcium arsenate used as the carrier for the nicotine, applied during periods of still air gave excellent results. The name Calarnic Dust has been given to this mixture

consisting of 8 oz. of nicotine sulfate in 8 lbs. of high-grade calcium arsenate and containing approximately 2.4 per cent of nicotine.

In dusting for the sugar cane borer by means of the airplane, it was found that when 5 per cent of dextrine was mixed with the calcium arsenate there seemed to be an increase in its effectiveness, and about 20 per cent of the borers were found dead in, and on, such treated cane. The most promising results, however, were secured from an application of sodium fluosilicate applied by a plane. Though the material used was in poor condition for dusting, examinations made 4 or 5 days after the dust was applied showed very few living larvae of any size, while more than 90 per cent of the larvae of all sizes were found dead on the leaves and within the stalks where the fluosilicate was plainly in evidence on the foliage. Many nearly grown larvae were found dead within their burrows. The killing effect appeared to continue for a number of days after the dust was applied. No serious burning of the cane resulted from the application of undiluted sodium fluosilicate. In tests of Baker's New Arsenical, it showed a fairly high degree of insecticidal effectiveness, but as a rule was not as effective as calcium arsenate applied at the same time.

Reference is made to the successful control at the Rice Station of the blister beetle on soy beans through the use of sodium fluosilicate.

[Economic entomology at the New Mexico Station] (*New Mexico Sta. Rpt. 1925, pp. 18, 19, 20*).—Brief statements are made of the status of work under way. In experiments with the San Jose scale, a rather thorough test of oil emulsions at Roswell showed a high percentage of control. In tests of red engine oil, with Kayso as an emulsifier, both 2 and 4 per cent mixtures gave good control, and an equally good control was obtained with a 2 per cent oil mixture with caustic potash as an emulsifier.

Reference is made to work with important insects affecting garden and field crops, including the cabbage aphid, cotton bollworm, onion thrips, Mexican bean beetle, Diabrotica beetles, and giant root borer. Tests with Blackleaf 40 and Nicofume for cabbage aphids showed Nicofume to be efficient and to cost practically the same per acre as the sulfate. In experimental work with onion thrips, Nicofume, Blackleaf 40, calcium cyanide dusts, and 3 per cent Blackleaf 40 wet spray were all effective when properly applied. It was found that dusting, to be effective, must be done in the open, as it is necessary to get the dust into the scapes of the leaves, and when so placed good control is obtained. Where doses as high as 3 oz. of paradichlorobenzene were used for the giant root borer, no signs of injury have been observed in apple trees 4 in. in diameter or larger.

[Economic insects in Bulgaria] (*Spis. Zeml. Izp. Inst. B''lgarīā (Rev. Insts. Recherches Agron. Bulgarie), 3 (1925), No. 2–3, pp. 169–175, 251–266, 271–300, figs. 2*).—P. Chorbadzhiev reports upon Observations of Some [Fourteen] Unknown and Little Known Insect Pests in Bulgaria (pp. 169–175); A. K. Drīenovski upon Grasshopper Pests in the Sofia District (pp. 251–262); T. Shopov and A. Trashliev upon Experiments and Observations Made at the Sericulture Experiment Station at Vratza (pp. 263–266); and I. Buresh upon Investigations of the Biology of ***Polychrosis botrana*** Schiff. and Means for Its Control (pp. 271–300).

Fleas and bed-bugs, E. McDaniel (*Michigan Sta. Circ. 94 (1926), pp. 8, figs. 5*).—This is a practical summary of information.

Demonstration of the virus of tsutsugamushi disease, M. Nagayo et al. (*Tokyo Imp. Univ. Govt. Inst. Infect. Diseases Sci. Rpts., 3 (1924), pp. 37–40, pl. 1*).—In continuation of the investigations of this disease, previously noted

(E. S. R., 37, 858; 46, p. 560), the authors report that the causative agent is nonfiltrable, noncultarable in common culture media, transmitted only by the mite *Trombicula akamushi*, and is multiformular and hardly stainable. The characteristics of the virus and typical clinical features of tsutsugamushi disease show that the virus is closely related to those causing typhus fever and Rocky Mountain spotted fever, even though the carrier of the former is lymph sucking and the latter two blood sucking. From its characteriscties as described, the authors can not assign it to either protozoa or bacteria, but they are inclined to the view that it is bacterial in nature.

A chemical investigation of some standard spray mixtures, R. E. ANDREW and P. GARMAN (*Connecticut State S.3. Bul. 278 (1926), pp. 491–508*).—The Bramberg method of determining small amounts of arsenic has been found by the authors to be adaptable to the determination of soluble arsenic in spray mixtures.

"Lime sulfur reacts strongly with [acid] lead arsenate, giving increased soluble arsenic and decreased sulfur in solution. It reacts similarly with lead arsenate and nicotine sulfate in combination and with lead arsenate and casein lime, but the reaction is not as great in the latter case. Nicotine sulfate does not react with lead arsenate or with lime sulfur so far as indicated by the chemical data; a color change is noted, the significance of which is not explained. When added to lead arsenate and casein lime together the soluble arsenic is increased; added to lead arsenate and lime sulfur together there is a marked decrease in soluble arsenic and also a decrease in the amount of sulfur in solution. When added to triple combinations of lead arsenate, casein lime, and lime sulfur, variable results are noted. Casein lime increases the soluble arsenic content of lead arsenate when mixed with it alone. When mixed with lime sulfur alone the amount of sulfur in solution is somewhat reduced. When added to nicotine sulfate and lead arsenate the soluble arsenic is distinctly increased, but when added to lime sulfur and nicotine sulfate the sulfur content of the solution is not greatly altered. In quadruple mixtures there is, in general, an increase of sulfur in solution due to the casein lime, and there is, in general, a decrease in soluble arsenic. The latter, however, may sometimes be increased. The lime in casein lime is largely responsible for the decrease in soluble arsenic where this material is used. Different orders of mixing quadruple mixtures give different results, but so many factors are involved and the variations are so small that the selection of improved mixtures seems an impossibility. Colloidal sulfur is sometimes formed in the spray mixtures. The color of the resulting mixture is not a satisfactory means of judging a spray solution."

A preliminary note on the lychee stink bug (Heteroptera, Pentatomidae), R. B. FALKENSTEIN (*Lingnaam Agr. Rev., 3 (1925), No. 1, pp. 64, 65*).—This is a report of observations made upon *Tessaratoma papillosa* Drur., a pentatomid which obtains food by piercing the bark of the younger stems and sucking out the sap of litchi. The pest is widely distributed throughout the Oriental region, having been recorded from India, Burma, Siam, Malakka, Sumatra, Java, the Philippines, south China, and other places. It is closely related to *T. javanica*. In and about India it feeds on the widely distributed soap nut tree (*Sapindus trifoliatus*), but in China apparently confines itself to the litchi (*Litchi chinensis* Sonn.) and the lungan (*Euphoria longana* Lam.). Two underternined hymenopterous egg parasites, one a chalcid, are said to constitute the main check on the pest, as high as 44 to 75 per cent of the eggs in different areas having been found parasitized. The majority if not all the overwintering adults gradually die off during the summer, many being attacked by a fungus of the *Penicillium luteum* group.

The chinch bug and how to fight it, W. P. FLINT and W. H. LARRIMER (*U. S. Dept. Agr., Farmers' Bul. 1498 (1926), pp. II+17, figs. 6*).—A practical summary of information on the chinch bug and means for its control.

The cotton flea hopper, H. J. REINHARD (*Texas Sta. Bul. 339 (1926), pp. 39, figs. 10*).—This is a report on the life history and habits of *Psallus seriatus* in the vicinity of College Station. The pest is widely distributed over Texas, and occurs in many other States, accounts by Hunter and others having been noted (E. S. R., 52, pp. 454, 553; 55, p. 352).

The injury to cotton resulting from the attack of *S. seriatus* is manifested by excessive shedding of very small squares, the suppression of fruiting branches, and the tendency of plants to abnormally tall growth. Croton or sageweed is the preferred food plant, but it has been reared on a large number of different species of plants, principally common weeds. Sageweed is also the preferred host plant, but the insect will oviposit in cotton, Atriplex, horsemint, wild sunflower, horse nettle, and May apple. It hibernates in the egg stage, the overwintering eggs beginning to hatch in March or April of the following spring. There are no distinct broods or generations of the insect, reproduction being continuous throughout the warm season. Cold weather in the fall kills all stages except the egg.

"The time required for complete development during the warm season varies from 16 to 29 days, averaging 22.5 days in May and June. Oviposition begins shortly after the insects become mature. During the act of oviposition the plant tissue is punctured by the ovipositor, and the eggs are laid singly within the plant. The duration of the egg stage varies from 6 to 12 days, depending upon prevailing temperatures. There are five nymphal stages in the development of the insect. The nymphs are active and feed on the tender portions of the plants by inserting the beak and sucking the plant sap. There is some indication that the insect may transmit a toxic virus."

No natural enemies of importance have been observed. Cultural measures of control are recommended. These consist of the early destruction of host plants and the practice of clean culture. Sulfur and sulfur naphthalene are effective insecticides.

Control of the cotton flea hopper in Texas, H. J. REINHARD (*Texas Sta. Circ. 40 (1926), pp. 8, figs. 2*).—This summary of information, based upon the bulletin above noted, deals particularly with control measures. It is pointed out that cultural measures are the most important and effective means of preventing infestation. They consists of good farming practices, including especially weed eradication and the destruction of cotton stalks. Sulfur applied as a dust is an efficient insecticide in controlling the pest.

The melon aphid and its control, F. H. CHITTENDEN and W. H. WHITE (*U. S. Dept. Agr., Farmers' Bul. 1499 (1926), pp. II+17, figs. 16*).—This is a revision of and supersedes Farmers' Bulletin 914, previously noted (E. S. R., 38, p. 764).

The aerial and subterranean life of aphids, particularly Eriosoma lanuginosum Hartig [trans. title], P. MARCHAL (*Compt. Rend. Acad. Sci. [Paris], 182 (1926), No. 3, pp. 189–191*).—This is a report on observations made of the life history of the pear root aphid (*E. lanuginosum*), which, as shown by Mordwilko and Börner, migrates in summer from galls on the elm to the roots of the pear, with a partial return to the elm in the fall. The species appears to seek the moisture and low temperature of the soil in the absence of such a condition above ground.

On a new nucleus disease or grasserie of the larvae of Pieris brassicae, and a new group of parasitic microorganisms [trans. title], A. PAILLOT (*Compt. Rend. Acad. Sci. [Paris], 182 (1926), No. 2, pp. 180–182*).—This is a

report of studies conducted in continuation of those previously noted (E. S. R., 53, p. 255). The author has erected the genus Borrellina for a group between the bacteria and protozoa, the causative organism of grasserie in the silkworm being named *B. bombycis*, that of grasserie in the pierids *B. brassicae*, and that of the new disease of the nucleus of this insect *B. pieris*.

Observations on Cirphis latiuscula H. Sch. in the Gulf coast region of Texas, R. A. Vickery (*Jour. Agr. Research [U. S.], 32 (1926), No. 12, pp. 1099–1119, figs. 3*).—The author reports upon studies conducted at Brownsville, Tex., between 1910 and 1917, of the noctuid *C. latiuscula*, which, under the name *Heliophila subpunctata*, he reported as injurious to sugar cane and grasses in 1915 (E. S. R., 34, p. 453). It has been recorded from Porto Rico, the American Tropics, and the southern parts of Texas, New Mexico, and Arizona.

The larvae are common in the sugar-cane fields during the winter and early spring, and occur on barley or oats during the winter in association with the larvae of the common armyworm *C. unipuncta*. *C. latiuscula* is an armyworm similar in habits, and may be associated with other species in local armyworm outbreaks throughout its range.

The parasites of this species were studied, and many caterpillars were collected and reared to determine the relative importance of the parasites. The most important species were found to be the common parasites of cutworms and armyworms, *Apanteles militaris* and *A. rufocoxalis*, and a common tachinid parasite of southern Texas, *Archytas piliventris*.

A two-year study of the development of the European corn borer in the New England area, G. W. Barber (*Jour. Agr. Research [U. S.], 32 (1926), No. 11, pp. 1053–1068, figs. 3*).—In this paper the author sets forth the results of a study of the development of the European corn borer in the field in the New England area, much of the data being presented in tabular and chart form. Comparisons of this development in different food plants and in different localities were made in the years 1922 and 1923, and considerable variation was found. On the whole, development was considerably more advanced on a certain date in 1922 than on the corresponding date in 1923, usually somewhat more advanced in weeds than in corn on the same date, and considerably more advanced in corn planted early than in corn planted somewhat later. By combining the accurate information on development obtained by the field counts with details of the life of adults as obtained by studies of caged individuals in the insectary, a chart of seasonal occurrence was constructed, which is thought to be a fairly accurate guide to follow in planning measures and mapping out campaigns for the control of the insect.

Timely information about the European corn borer, L. H. Worthley and D. J. Caffrey (*U. S. Dept. Agr., Misc. Circ. 70 (1926), pp. 8, figs. 4*).—This is a brief practical summary of information, with special reference to the Lake Erie region.

A revision of the adult anopheline mosquitoes of Japan, S. Yamada (*Tokyo Imp. Univ., Govt. Inst. Infect. Diseases Sci. Rpts., 3 (1924), pp. 215–241*).—This work will consist of systematic descriptions of 13 Anopheles occurring in Japan, of which 3 are new, together with accounts of their habits and their relations to human diseases. In this first contribution a table of the 13 species is presented, and 5 species are described.

Determination of the percentage of infestation by the Hessian fly, Phytophaga destructor Say, W. H. Larrimer and W. B. Cartwright (*Jour. Agr. Research [U. S.], 32 (1926), No. 11, pp. 1041–1044*).—The authors find that in general practice in studies of Hessian fly infestation, it is possible to take a sample which quite closely approaches a theoretically representative sample.

In case a representative sample is taken, the probable error is determined by the number of culms taken and the percentage of infestation. Whatever the method of taking a sample, the probable error can be computed, and should be recognized and accepted as a part of the determination.

Determination by the 5-square-yard method of the yield of wheat plots used in studies of the Hessian fly, Phytophaga destructor Say, W. B. Cartwright and W. H. Larrimer (*Jour. Agr. Research* [*U. S.*], *32* (*1926*), *No. 11, pp. 1045–1048*).—In analyzing the damage of the Hessian fly to wheat, field harvests by the 5-square-yard method showed an error of sampling ranging from 6.3 to 13.8 per cent, and an average error of 10.3 per cent of the computed average yields. Other 1/968-acre harvests did not prove superior in accuracy or in refinement of determination to the 5-square-yard method.

Determination of the percentage of parasitism of the Hessian fly, Phytophaga destructor Say, W. H. Larrimer and W. B. Noble (*Jour. Agr. Research* [*U. S.*], *32* (*1926*), *No. 11, pp. 1049–1051*).—The authors conclude that considerable confidence can be placed on a percentage of parasitism of the Hessian fly expressed by the percentage of parasitism of a sample lot of flaxseeds with the appropriate probable error determined theoretically.

[Work with the cabbage root maggot at the Alaska Stations], C. C. Georgeson (*Alaska Stas. Rpt. 1924, p. 2*).—It was found that the application several times a week of a solution containing 3 per cent of carbolic acid was the most effective remedy tried for the cabbage root maggot.

The black maize beetle (Heteronychus licas Klug.), C. B. Symes (*Rhodesia Agr. Jour., 22* (*1925*), *Nos. 1, pp. 83–98, pl. 1, figs. 3; 2, pp. 207–224*).—An account of the life history and control of this scarabaeid beetle, which is an important enemy of corn in the midland districts of Rhodesia, in continuation of the account previously noted (E. S. R., 39, p. 565).

The granary weevil, E. A. Back and R. T. Cotton (*U. S. Dept. Agr. Bul. 1393* (*1926*), *pp. 36, figs. 9*).—This is a report on studies of the life history and habits of this weevil based on work conducted in Florida from 1919 to 1921 and in the vicinity of Washington, D. C., from 1921 to 1923. Descriptions are given of its several stages and natural enemies, and control measures are dealt with, much of the data being presented in tabular form. A list of 73 references to the literature is included.

The biology of Macrocentrus ancylivora Rohwer, an important parasite of the strawberry leaf roller (Ancylis comptana Froehl.), D. E. Fink (*Jour. Agr. Research* [*U. S.*], *32* (*1926*), *No. 12, pp. 1121–1134, figs. 9*).—The author reports that during the course of investigations in the biology of the strawberry leaf roller in 1920 and 1921, 12 species of parasites were reared, of which the most abundant and effective was a large yellowish braconid, later described by Rohwer as new to science under the name *M. ancylivora* (E. S. R., 50, p. 359). In the vicinity of Riverton, N. J., it was found to parasitize from 50 to 60 per cent of the host larvae, all larval stages being attacked.

From dissections of the ovaries it was found that the number of eggs which a female contains ranges from 384 to 768. Incubation of the egg requires from 3 to 13 days. The first larval stage requires from 3 to 8 days for development, the second and third larval stages each require 2 days, and the fourth larval stage 1 day. The prepupal stage lasts from 24 to 36 hours and pupation from 8 to 10 days. The adult lives from 5 to 8 days. When the third and fourth stages are parasitized, the length of time required for the development of the parasite is less than when younger stages of the host are attacked. There are three generations of this parasite in New Jersey annually, the first being the most abundant. *M. ancylivora* passes the winter as a mature first-stage larva within the full-grown hibernating host larva of the strawberry leaf roller.

Investigations of postembryonic forms of chalcids [trans. title], H. L. PARKER (*Ann. Soc. Ent. France, 93 (1924), No. 4, pp. 261–379, pls. 38*).—This account deals with (1) postembryonic forms of the Chalcidae (pp. 264–312), (2) comparative morphology (pp. 312–328), (3) the larval forms (pp. 329–337), and (4) general considerations (pp. 337–351). A general index (pp. 351–362) and bibliography (pp. 363–370) are included.

The pear leaf blister mite as an apple pest, I. M. HAWLEY (*Utah Sta. Bul. 197 (1926), pp. 16, figs. 3*).—This account of the pear leaf blister mite includes a report of experimental control work. Spring spraying is advised in preference to fall spraying in fruit-growing sections of the State. It is recommended that when there is a severe outbreak a dormant spray of lime sulfur at the rate of 1 gal. to 11 gal. of water should be used. If lubricating oil emulsion is used this should be applied at a 7 or 8 per cent strength.

ANIMAL PRODUCTION

Systemic and sex determinants of bone growth (Mus norvegicus albinus), F. S. HAMMETT (*Biol. Bul. Mar. Biol. Lab., Woods Hole, 50 (1926), No. 1, pp. 61–71, fig. 1*).—An analysis of the effects of systemic and sex factors on bone growth has been made from the lengths and weights of the humerus and femur and the body weight and body length of the rats used in the biochemical study of bone growth noted on page 491.

The data show that the growth capacity given as grams per 100 gm. and millimeters per 100 mm. per day of the femur is greater than that of the humerus in both sexes up to 65 days of age, after which differences are insignificant. The influence of systemic factors on bone growth at different ages is discussed, and it is pointed out that such differences are in degree rather than in the course of development. Sex factors, however, influenced the course as well as the rate of growth. Both bones were slightly but consistently heavier in the male than in the female. The relation of the growth of the bones and body weight to age is discussed, and it is concluded that the systemic correlation is closer than the sex correlation and that the sex factors are superimposed upon the systemic factors for bone growth. The sex influences are mainly correlated in time of appearance with certain sex specific stages in gonad development.

Correlations between the weights of the two bones and the lengths of the two bones with body weight and body length stabilized by partial correlations were higher for weight than for length in both sexes. This signifies that systemic association in length is more dependent on general size factors for length than is systemic association in weight dependent on general size factors for weight. The growth capacity of the bones in weight was found to differ more in type and degree from body weight than the growth capacity of the bones in length differed from the growth capacity in body length. Systemic association of sex in both weight and length also appeared to be greater in the male than in the female according to the correlations.

Investigation on the mineral content of pasture grass and its effect on herbivora, I–V, W. ELLIOT, J. B. ORR, and T. B. WOOD (*Jour. Agr. Sci. [England], 16 (1926), No. 1, pp. 59–104, figs. 10*).—Five papers in this series are reported, including results noted to some extent previously (E. S. R., 55, p. 259).

I. *General report,* W. Elliot (pp. 59–64).—This gives an outline of the plan of the investigation of the mineral contents of pastures in England, Scotland, and Wales, together with the results of various cooperative feeding experiments with herbivora conducted in connection with them.

II. *Report on the effect of the addition of mineral salts to the ration of sheep,* W. Elliot and A. Crichton (pp. 65–77).—This paper reports results of four experiments, two of which were previously noted, carried on to determine the relation of minerals to the bent-leg condition in sheep.

There were five groups of 6 sheep each fed for 145 days in the third experiment. All received the basal ration with various supplements. Those receiving sodium chloride and calcium carbonate ad libitum made the best growth and appeared to be in perfect health. The lot receiving 20 cc. of cod-liver oil showed no malnutrition and tended to be fatter, but they did not develop as much bone as the lot receiving lime. The other three lots receiving the basal ration only or with additions of 20 cc. of olive oil per head daily or sodium chloride ad libitum developed rickets after 75 days.

The injurious effects of too large quantities of a mineral were demonstrated in the fourth experiment. Forty breeding ewes were divided into two lots. Each was fed, in addition to 0.5 acre of pasture, on straw, turnips, oats, and bran, and one lot received 8 gm. of soluble calcium chloride per head daily. The group receiving no mineral supplement produced 21 living lambs, while the calcium-fed group produced only 6 living lambs. There were a number of abortions and many cases of malpresentation in the latter group. The living lambs from the calcium-fed lot were, however, heavier at birth.

III. *Report on the chemical analyses of samples of pasture from various areas in the British Isles,* W. Godden (pp. 78–88).—This is a detailed account of the study previously noted.

IV. *Report on the seasonal variations in the mineral content of pastures,* E. M. Cruickshank (pp. 89–97).—This is a more detailed account of the studies which have been briefly noted.

V. *Report on the effect of fertilizers on the mineral content of pastures,* W. Godden (pp. 98–104).—The mineral contents of red clover, temporary, and moorland pastures grown on plats receiving applications of various commercial fertilizers were determined. Considerable modification in the mineral contents of the grasses accompanied the fertilizer treatments. The largest changes were observed in the amounts of calcium and potassium, and somewhat less in phosphorus. Increases in calcium also appeared to be associated with increases in the nitrogen content.

The use of salt in range management, W. R. Chapline and M. W. Talbot (*U. S. Dept. Agr., Dept. Circ. 379 (1926), pp. 32, figs. 20*).—This publication discusses the salt requirements of livestock, salting places and containers, and the distribution of salting places to bring about a more equal and economic utilization of the range.

[Analyses of range grasses] (*New Mexico Sta. Rpt. 1925, p. 17*).—Analyses of five grasses taken from ranges where considerable losses in the calf crop occurred are presented as follows:

Chemical analyses of range grasses

Name of grass	Water	Protein	Ether extract	Crude fiber	Nitrogen-free extract	Ash
	Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
Bouteloua gracilis	4.85	2.70	1.75	33.40	49.76	7.54
Andropogon neo-mexicanum	5.09	1.20	1.10	37.42	48.19	7.00
Koeleria cristata	5.10	1.40	.52	40.13	48.23	4.62
Blepharoneuron tricholepis	4.82	2.48	1.30	30.70	49.71	10.99
Aristida divaricata	4.75	1.80	1.29	33.18	51.43	7.55

Silos and silage, L. E. Hazen, W. L. Blizzard, P. C. McGilliard, and A. Daane (*Oklahoma Sta. Circ. 60 (1926), pp. 1–7*).—This deals briefly with the crops for silage and the desirability of silage for the various classes of farm animals.

A study of the process of making clamp silage, A. Amos and H. E. Woodman (*Jour. Agr. Sci. [England], 15 (1925), No. 4, pp. 444–453*).—In continuing the series of silage studies noted on page 410, an account of the composition of oat and tare silage made in a clamp silo is given. The crop was ensiled between June 20 and July 2. The feeding of the silage began in September and was completed in February. There was a very thick layer of moldy material over the top of the plant, which represented approximately 19 per cent of the total silage. Bad spoilage was also found for an average of 12 in. around the sides. The bottom layer consisted of wet sour silage, while the middle consisted of brown sweet silage. There was thus a great deal of waste in this method of preparing silage.

Analysis of the material was made from bags placed at different depths, and showed that in the sour silage layer there was a loss of more than one-fifth of the dry matter and a heavy loss of carbohydrates. Volatile bases and volatile organic acids were present in this layer in relatively large amounts as compared with the nonvolatile organic acids and amino acids. The crude protein consisted largely of ammonium compounds of organic acids, and was decidedly lower than the crude protein of green oats and tares in nutritive value. There was a high percentage of fiber. The loss of dry matter in the layer of sweet silage was comparable to that in green fruity silage produced in tower silos. The making of clamp silage is discouraged because of the accompanying spoilage and loss of nutrients, except for use under extraordinary conditions.

A study of the process of making stack silage, H. E. Woodman and F. Hanley (*Jour. Agr. Sci. [England], 16 (1926), No. 1, pp. 24–50, fig. 1*).—In continuing the study of the methods of making silage noted above, red clover and rye grass, red clover and cocksfoot, rye, oats, and tares, and small amounts of other grasses were preserved as stack silage during the season of 1924, which was unfavorable for hay production because of wet weather. Information was obtained on the types of silage produced in stacks, temperature changes, amount of settlement, types of fermentation, losses of dry matter, magnitude of changes affecting individual constituents, amount of wastage from spoiling, and the nutritive value.

Stacking of the partly dried grass was begun on June 9 and continued with daily additions of wet or partly dried grasses until June 20. The total thickness of the layers added to the stack was 39.5 ft., but settling was so rapid that the stack never reached a greater height than 17.5 ft., and after settling was nearly complete on July 14 the stack was 9.5 ft. high. The temperature was determined daily in the stack by lowering a thermometer in an iron pipe. It was found that the temperature arose abruptly during the first two days after stacking to 71.5° C. with a further rise to 73.9° during the next four days. This increase was attributed to respiratory changes in the living plant cells. A drop to approximately 60° followed the high temperature but another rise to 72.2° occurred on the twenty-sixth day, after which there was a continuous and fairly uniform cooling. The second rise in temperature is attributed to the activity of bacteria of the thermophilic group, which are especially active in their attacks on cellulose. The chemical changes resulting in the silage are discussed from this standpoint.

Six sample bags were placed in the stack at different times during harvesting. The composition of the material in the bags was determined when fresh and after ensiling. These data showed that the loss of dry matter in the sweet silage layers compared satisfactorily with that found in the tower silo. The initial high temperature produced tended to inhibit the cleavage of proteins into amino acids. The action of molds was demonstrated in some of the samples. The loss of carbohydrates was much smaller than was anticipated, considering the high temperatures attained. The decrease in the digestibility of the protein noted in the paper below was shown to be due to the bacterial transformation of part of the protein into a dark humin-like material, which was relatively insoluble. It was estimated that approximately 29 per cent of the total stack was spoiled, while 50 per cent was good sweet silage and the remainder was edible but much lighter in color and contained some butyric acid.

The nutritive value of stack silage (rye grass and clover), H. E. Woodman (*Jour. Agr. Sci.* [*England*], *15* (*1925*), *No. 3, pp. 327–333*).—The digestibility of the sweet rye grass and clover stack silage prepared and studied in the paper above is given as determined with two sheep. The average digestion coefficients were dry matter 47.2 per cent, organic matter 49.3, crude protein 12.2, fat 70.0, nitrogen free extract 55.9, crude fiber 53.8, and ash 26.4 per cent. The most notable feature of the results was the low digestibility of the protein. Three possible reasons for this are suggested, the most probable of which appeared to be the changes accompanying the exposure of the silage to the high temperature of approximately 80° C. (176° F.) for a long period. The excellent digestibility of the crude fiber is also noted.

Studies on the toxicity of copra meal, I, V. Sulit (*Philippine Agr.*, *14* (*1926*), *No. 9, pp. 511–522, figs. 3*).—The feeding of rations containing 75, 80, or 85 per cent of copra meal to guinea pigs at the University of the Philippines resulted in death in from 16 to 42 days. The remainder of these rations consisted of casein, butterfat, and a mineral mixture, with sufficient tomato juice to prevent scurvy. When the amount of copra meal was reduced to 37.5 per cent and the composition of the ration kept similar by the addition of cornstarch, the experimental animals were in better health and vigor and made larger gains than control animals on a ration of corn, rice, casein, butterfat, and minerals.

The experiment was repeated with two kinds of copra meal, the one containing approximately 16 and the other 6 per cent of fats and oils. The symptoms of the animals on the ration containing large amounts of copra meal were first a decrease in weight, dullness, coarse and rugged hair, arched back, sensitiveness to light, regional paralysis, constipation later followed by diarrhea, blood exudation with feces or urine, emaciation, and death.

The author concludes from the results of his experiments that copra meal is toxic when fed in amounts as large as 75 per cent of the ration.

A study of the frequency of calving of cows under Philippine conditions, V. Villegas (*Philippine Agr.*, *14* (*1926*), *No. 9, pp. 541–547*).—This gives the results of a study of the frequency of calving of 79 range cows kept on two ranches in the Philippines. The study was based on 193 calvings. The average interval between calvings was 361.5 days on one ranch and 337.1 days on the other.

[Experiments with beef cattle at the New Mexico Station] (*New Mexico Sta. Rpt. 1925, pp. 57–61*).—The results of the following experiments are briefly reported:

Fattening yearling steers.—In continuing this series of experiments (E. S. R., 53, p. 169) three lots of steers, averaging approximately 360 lbs. in weight,

made average daily gains of 1.93, 1.95, and 2.09 lbs. on rations consisting of cane silage, cottonseed meal, and milo; cane silage, cowpea hay, and milo; and cottonseed meal, milo, and fodder, respectively. The calculated profits per head were not in proportion to the gains, but were for the respective lots $2.14, $3.58, and $0.58 per head.

Supplemental feeding of beef cattle on the range.—Fifty head of weaned heifer calves were divided into five lots to study the effect of supplemental feeding on the calf crop, the weights of the calves at birth, and the gains of the calves in succeeding feeding periods. The preliminary results indicate that when the lot receiving no supplemental feed was gaining, or when the forage was more than sufficient for maintenance, there were more or less regular and equal amounts of gain accompanying each additional half-pound of cake fed, up to and including 1.5 lbs. per head daily, but that those receiving 2 lbs. of cake per head daily made less gains than those receiving 1.5 lbs.

The mutual influence of the proportion of the several nutrients, in feeds, on their digestibility.—In preliminary work on this project, dealing with the amount of cotton-rag filter paper pulp which could be included in the ration of pulp and alfalfa only, it was found that 60 per cent or more could be fed without causing the steers to go off feed. Further experiments showed that steers receiving 0, 15, 30, and 45 per cent of cellomass, respectively, in rations with alfalfa hay during 49-day periods, and 60 per cent of cellomass for 28 days, showed that the animals receiving the paper pulp in their rations made larger gains for the entire experimental period of 226 days than those receiving alfalfa hay only. Data collected during the experiment indicate the possibility of estimating metabolic nitrogen by using a series of rations composed of paper pulp, starch, and alfalfa in such proportions that the nitrogen content of the excreta from the alfalfa becomes zero. If the metabolic nitrogen could not be obtained by direct computation, it could at least be estimated by extrapolation.

Effects of winter rations on pasture gains of two-year-old steers, E. W. Sheets, E. A. Livesay, R. H. Tuckwiller, and A. T. Stemple (*West Virginia Sta. Bul. 191 (1925), pp. 31, figs. 27*).—Essentially noted (E. S. R., 51, p. 772).

Baby beef production, J. Hunter-Smith (*Jour. Min. Agr.* [*Gt. Brit.*], *32 (1925), No. 9, pp. 779–786, pls. 2*).—The results of producing 10 baby beeves in experiments at the Herts Institute of Agriculture are reported. The individual weights of the animals are given at various periods up to 64 weeks of age. Seven of the animals made an average daily gain of 2 lbs. per head between birth and weaning. These results were compared with the feeding of 3-year-old steers.

Winter feeding ewe lambs, W. E. Joseph (*Natl. Wool Grower, 15 (1925), No. 12, pp. 40, 41*).—In comparing methods of wintering ewe lambs at the Montana Experiment Station, 3 lots of 36 or 37 lambs per lot, averaging 78 lbs. per head, were wintered mainly on alfalfa hay. Two of the lots received all the hay they would eat without waste, and 1 of them was given 0.23 lb. of oats per head daily. The third lot received 10 per cent less hay than was consumed by the lot not receiving oats. During the 77-day feeding period average daily gains were made as follows: Full feeding of hay 0.08 lb., hay and oats 0.14 lb., and limited feeding of hay 0.04 lb. The lambs in the first lot were in practically the same condition at the end of the experiment as at the start. The condition of those receiving oats was improved considerably, but those receiving the limited hay ration were in poorer condition. There were small differences in the weights of the fleeces and the weights of the yearling ewes in the different lots, but much variability was found within the lots. The more liberal hay

feed is recommended because of the better condition of the ewes and their probable greater ability to withstand unfavorable conditions.

[Swine feeding experiments at the Iowa Station], J. M. EVVARD, C. C. CULBERTSON, W. E. HAMMOND, and Q. W. WALLACE (*Iowa Sta. Leaflets 14 (1926), pp. 8; 15, pp. 7*).—These two leaflets give popular accounts of pig-feeding experiments which have been mainly noted from other sources (E. S. R., 53, p. 774; 55, p. 264), the first being entitled Hogging Down the Corn to Best Advantage, and the second The Utilization of Oats in the Growing and Fattening of Spring Pigs.

Soybean forage for hogs, E. G. GODBEY and A. L. DURANT (*South Carolina Sta. Bul. 228 (1926), pp. 3–15, figs. 4*).—The results of four comparative tests of fattening hogs in dry lot and on soy bean forage are given, the first three of which have been briefly noted from annual reports (E. S. R., 54, p. 665).

Ten pigs were full-fed in dry lot on corn and tankage, while 15 were given a 2 per cent corn ration with the soy bean forage for from 36 to 71 days, followed by a finishing period on corn and tankage in dry lot. The combined results of the four trials showed that the pigs receiving the full-fed ration of corn and tankage in dry lot made average daily gains of 0.86 lb. per head while the other lot was on pasture, and required 353 lbs. of corn and 50 lbs. of tankage per 100 lbs. of gain. The lots receiving the limited ration of corn with soy bean pasture made average daily gains of 1.03 lbs. and consumed 130 lbs. of corn per 100 lbs. of gain. During the finishing period, the pigs fed in dry lot made average daily gains of 1.34 lbs. per head and required 407 lbs. of corn and 45.5 lbs. of tankage per 100 lbs. of gain. The pigs which had originally been on pasture made average daily gains of 1.53 lbs. and required 409 lbs. of corn and 29 lbs. of tankage per 100 lbs. of gain during the same period.

It is pointed out that the pigs on the soy bean forage were more thrifty than those fed in dry lot, and the gains were produced more economically with the soy beans.

Pastures for hogs reduce the cost of producing pork in eastern Virginia, C. R. NOBLES (*Virginia Sta. Bul. 246 (1926), pp. 16, figs. 3*).—The results of experiments conducted from 1919 to 1925, in which pigs were fed with full and limited rations of corn and tankage on summer or winter pasture, are reported and compared with similar rations fed in dry lot. The pastures consisted of 2-acre lots of Abruzzi rye, rape, soy beans, alfalfa, and crimson clover for each group of from 8 to 10 pigs. The combined results, with the feeding of the different amounts of grain, are summarized in the following table:

Comparison of summer and winter pasture and dry lot feeding

Kind of feeding	Number of trials	Average initial weight	Average daily gain	Feed required per 100 pounds gain	
				Corn	Tankage
		Pounds	*Pounds*	*Pounds*	*Pounds*
Summer pasture alone with grain finishing	3	31.5	0.41	161	12
Summer pasture with 25 per cent grain ration	3	32.3	.71	224	20
Summer pasture with 50 per cent grain ration	7	37.4	.94	251	36
Summer pasture with 75 per cent grain ration	7	37.1	1.07	341	37
Summer pasture with self-fed grain ration	7	38.0	1.31	393	43
Dry lot with 50 per cent grain ration	2	45.2	.70	370	41
Dry lot with 75 per cent grain ration	2	44.0	.95	409	45
Dry lot with self-fed grain ration	4	45.4	1.09	412	46
Winter pasture with 50 per cent grain ration	3	41.0	.85	330	37
Winter pasture with 75 per cent grain ration	3	40.6	1.06	374	42
Winter pasture with self-fed grain ration	3	41.0	1.33	373	41
Dry lot with self-fed grain ration	3	39.2	1.19	378	42

These results showed that the amounts of concentrates required per unit of gain were reduced when forage crops were available, but the pasture crops alone or with the addition of a 25 per cent grain ration were unsatisfactory. The 50 per cent grain ration with pasture appeared generally to be most economical, but the earlier finish produced by the self-fed ration on pasture must also be considered.

In two trials, sweet potatoes and *tankage* were compared with corn and tankage. Satisfactory gains were made on both rations, 1.85 and 2.27 lbs. per day, respectively, and the desirability of utilizing waste sweet potatoes in this way is considered important.

A chart is presented for readily calculating the costs of gains with fluctuating feed and pasture prices.

The milk of the Improved Landschwein and its composition [trans. title], J. SCHMIDT and E. LAUPRECHT (*Züchtungskunde, 1 (1926), No 2, pp. 50–62, figs. 4*).—The authors discuss the influence of various factors on the composition and the amount of milk produced by sows of this breed, based mainly on other investigations. The milk production was shown to be smaller in first litters than in succeeding ones and also lower in case of small litters than in large litters. The anterior sections of the mammary gland appeared to be more productive than the posterior portions. The fat content of the colostrum was slightly less than that of normal milk, but the protein content of the former was much higher, averaging 16.27 per cent as compared with 6.25 per cent for normal milk.

[Experiments with poultry at the New Mexico Station] (*New Mexico Sta. Rpt. 1925, pp. 50–56*).—Reports of investigations and progress are given.

Cottonseed meal feeding experiments.—The first six months' results are given of the egg production of four different lots of hens receiving various combinations of tankage and cottonseed meal as sources of protein in the laying mash. The results show that the pen receiving tankage only consumed the smallest amount of feed and the calculated feed cost was less, but the number of eggs produced was only slightly more than the number produced by the pen receiving equal parts of tankage and cottonseed meal in the mash. The present indications are that fresh cottonseed meal is an economical source of protein for egg production.

[*Inheritance of egg-laying ability*].—In studying the inheritance of egg-laying capacity, ten females ranging in production from 125 to 180 eggs or more have been mated to outstanding males whose ancestors were good producers. The results of two seasons' work show that there has been no decrease in egg production in either the second or third generation, and in most cases the second generation birds were better producers than their dams. Six months' production records of the third generation indicate that there has been no decrease as compared with their dams in this generation. Egg production for the entire station flock has been increased 17 per cent in one year through the selection of proved females and good males as breeders. The second year of selection in this way has not resulted in such marked improvement.

Incubation and brooding experiment.—Data on the chick production from 50 White Leghorn, high-producing females mated with 4 outstanding cockerels have indicated that there are outstanding advantages to the production of early hatched chicks from the standpoint of growth and development based on the completion of the first half of this experiment. From the standpoint of economy of production March and April hatched chicks appeared to be superior.

Mammoth incubators in the Philippines, F. M. FRONDA (*Poultry Sci., 5 (1925–26), No. 2, pp. 67–75, figs. 4*).—An account is given of the incubation of

duck eggs in a primitive type of mammoth incubator relatively common in certain localities in the Philippine Islands. These incubators, which have a capacity of 10,000 to over 60,000 eggs, consist of cylindrical baskets placed inside boxes insulated with rice hulls. Heat is furnished during the first part of incubation by heated whole rice, but during the latter part no additional heat is supplied. It is claimed that over 54 per cent of the eggs hatch in such incubators.

These incubators are largely used for the production of balut, the name given to the fertile egg after 14 to 20 days of incubation, which is a very popular food in Manila. The infertile eggs are hard boiled and sold as penoy. Eggs too old for incubation are salted for from 12 to 14 days, hard boiled, and sold as maalat.

DAIRY FARMING—DAIRYING

Manual of dairying, J. RENNES (*Manuel du Laitier. Versailles: La Gutenberg, 1925, pp. 65, pls. 6*).—This deals with clean milk production and the selection of dairy cattle.

The rationing of dairy cows for milk production, J. MACKINTOSH (*Jour. Farmers' Club [London], 1926, pt. 2, pp. 17–38*).—Popular directions for dairy cattle feeding.

Wyoming native hay for milk production, H. S. WILLARD (*Wyoming Sta. Bul. 145 (1926), pp. 17–30, figs. 3*).—The results of five experiments are reported in which native Wyoming hay was analyzed and compared with other feeds for milk production.

One lb. of native hay v. 1 lb. of alfalfa.—Native hay was compared with alfalfa hay, pound for pound, when fed to 4 cows receiving sunflower silage and a grain mixture in addition. The alfalfa hay was fed during the first and third 30-day periods, with the native hay fed during the second period. The results showed that 6.74 per cent more milk and 8.11 per cent more butterfat were produced during the average of the two periods when alfalfa hay was fed than when native hay was used.

Feeding hay in the corral.—In this experiment 3 cows were fed alternately during five 30-day periods on alfalfa or native hay in a corral. Those receiving the alfalfa hay consumed an average of 1.4 lbs. less grain and 5.5 lbs. more of hay per day than those receiving the native hay. The former lot produced 4.54 lbs. more milk per head daily and 0.18 lb. more butterfat than those receiving the latter ration. A study of the cost of milk production from this experiment showed that the estimated profit was greater when alfalfa hay was fed.

Balancing the native hay ration.—Since the main faults of the native hay appeared to be its low palatability and lack of protein, 4 cows were used for comparing a ration of alfalfa hay with native hay with which 20 per cent of cottonseed meal and linseed meal was added to the grain mixture. The results of this experiment showed that the cows receiving the alfalfa hay ration consumed daily an average of 3.8 lbs. less grain, 4.9 lbs. more hay, and 3 lbs. more silage and produced 3.44 lbs. more milk but 0.029 lb. less butterfat than those receiving the native hay ration. The former lot maintained a relatively constant weight, while those on native hay gained an average of 13 lbs. in 30 days.

Combining alfalfa and native hay.—In this trial, 2 cows were fed alfalfa hay in the morning and native hay in the evening during the second of three 30-day periods. A grain mixture and sunflower silage were fed throughout.

The production of milk and butterfat were slightly superior on the straight alfalfa ration, the differences being 3.1 and 9.9 per cent, respectively.

The effect of adding 10 per cent cottonseed meal to a ration made up mostly of bran.—During this test with 4 cows, 10 per cent of cottonseed meal was added to a basal grain ration consisting of 3 parts of bran, 2 parts of oats, and 1 part of corn when fed with sunflower silage and native hay ad libitum. The results showed that the supplements increased the milk production 5 per cent, with an estimated increase in the profits.

The general conclusions from these experiments indicate that alfalfa hay is superior to native hay in feeding value, due to its greater palatability and higher protein content. The advantages for feeding alfalfa hay as compared with native hay supplemented with protein depend upon the price received for the milk.

Mineral metabolism studies with dairy cattle: Mineral equilibrium during gestation, H. G. MILLER, W. W. YATES, R. C. JONES, and P. M. BRANDT (*Amer. Jour. Physiol.*, 75 (1926), No. 3, pp. 696–703).—The mineral balances of the 3 cows used in the previous studies from the Oregon Experiment Station (E. S. R., 54, p. 166) have been determined when 2 of the cows were in the gestation period and when 1 was early in lactation. The cows received similar rations, and the methods employed were much like those used in the earlier studies. During gestation the balance of all elements except chlorine was positive on the basal ration. Kale and bone meal were favorable to mineral assimilation. The evidence also indicated that the absorption of calcium and phosphorus was somewhat dependent upon the demands of the animal, although the character of the rations also affects the mineral retention and the acid base equilibrium.

Alfalfa and soybean hay for growing heifers, C. C. HAYDEN (*Ohio Sta. Bimo. Bul.*, 11 (1926), No. 3, pp. 98–103, figs. 6).—Alfalfa and soy bean hay were compared for dairy heifers when fed from January 1 to July 13, 1923, on a ration of 2 parts of hay and 1 part of ground corn. There were 3 heifers on each ration. Those receiving alfalfa consumed more feed than those receiving soy bean hay, due to their failure to eat the coarse stems of the soy beans, and the animals in the former group made greater gains in all body measurements than those receiving soy bean hay. The average daily gains in live weight were 1.37 lbs. for the alfalfa lot and 1.43 lbs. for the soy bean hay lot. All 6 heifers grew above the normal rate. At the conclusion of the above test the heifers were continued on alfalfa, clover, and new soy bean hay until the following spring. Some disturbances accompanied the changes in the roughages, but all made better than normal growth, and the breeding records were normal.

The favorable results indicate that where legume hays are available it is not necessary to supplement corn with a variety of other proteins for growing heifers.

Correlations in the exterior of milk cattle, J. H. W. T. REIMERS (*Ann. Univ. Stellenbosch*, 3 (1925), A, No. 2, pp. 20).—Based on measurements of 300 cows from 2.25 to 3 years of age entered in the Friesland Herdbook of the Netherlands, the correlation between height at withers and the percentage relation of other body measurements to height has been determined as follows: Length of rump -0.41 ± 0.047, height at the end of the loin -0.046 ± 0.058, depth of breast -0.30 ± 0.052, breadth of breast -0.18 ± 0.056, width over the hips -0.22 ± 0.055, width of thurl -0.14 ± 0.056, and width of rump -0.24 ± 0.055. The author points out that selection by the breeders and

judges of animals for entrance in the herdbook may have influenced the correlations. The negative correlations indicate the improbability of combining various desirable characters in the same animal.

Studies in milk secretion.—XVII, Transmitting qualities of Guernsey sires for milk yield, butter-fat percentage, and butter-fat, J. W. GOWEN (*Maine Sta. Bul. 329 (1926), pp. 48, pls. 2, figs. 2*).—In continuing this series (E. S. R., 55, p. 171), the 551 Guernsey sires having 2 or more tested daughters from tested dams, both with 365-day records (E. S. R., 54, p. 673), are tabulated, showing the net change in the age, corrected milk yield, and butterfat percentage and the quartile changes in the milk and butterfat production of the daughters as compared with their dams. The difference between the average production of the sire's daughters and their dams is considered as the transmitting quality of the sire. The probable errors of the differences between the milk and fat yield are tabulated for the entire population according to the number of daughters which a bull has. Special attention is called to the large probable errors in the case of bulls having few daughters. The bulls which raise the milk yield or butterfat percentage of their daughters as compared with their dams more than three times the probable error are tabulated, and available photographs of such animals were studied.

The large amount of variation observed in the conformation of both groups indicated that no incompatibility existed as far as conformation was concerned between milk production and butterfat percentage. Conformation as far as size is concerned has been found related to milk production, but neither the conformation of the daughter nor her parents has been found related to the fat percentage in the milk.

Dairy qualities of the crossbred cattle [at the Kodiak Station], C. C. GEORGESON (*Alaska Stas. Rpt. 1924, pp. 30-38, figs. 15*).—A progress report is given of the Galloway-Holstein crossbreeding experiment (E. S. R., 49, p. 467), including illustrations of certain of the foundation animals and the crossbreds which have been produced. Two Galloway foundation cows averaged 3,139 lbs. of milk in 5 lactation periods, and the two Holsteins averaged 6,381 lbs. in 6 lactations. The milk yields of 5 crossbred animals during the year ended December 31, 1924, ranged from 4,269 to 5,383 lbs. The average butterfat content of the milk of the crossbreds was 3.8 per cent, of the Galloways 5.27 per cent, and of the Holsteins 3.07 per cent.

Milk goat improvement (*New Mexico Sta. Rpt. 1925, pp. 46, 47*).—In continuing the study of the effect of crossing purebred Toggenburg bucks with native goats (E. S. R., 51, p. 476), it has been found that the Toggenburg buck is prepotent in fixing breed characteristics when bred to native or scrub does, but the color is not transmitted as consistently to the offspring when the dams are white as when they are dark in color. So far half-blood, three-quarter-blood, and seven-eighths-blood Toggenburgs have been produced and tested for milk yield and butterfat percentage. By this method of breeding up there has been a marked increase in milk production, a slight increase in butterfat production, but a decrease in the percentage of butterfat in the milk in each succeeding generation.

Advanced registry testing, A. D. BURKE and P. C. MCGILLIARD (*Oklahoma Sta. Circ. 61 (1926), pp. 29, figs. 7*).—Popular information on methods and directions for conducting advanced registry tests are given.

Fourteenth annual report of the International Association of Dairy and Milk Inspectors, compiled by I. C. WELD (*Internatl. Assoc. Dairy and Milk Insp. Ann. Rpt., 14 (1925), pp. 286, figs. 7*).—The usual report of the annual

meeting of this association (E. S. R., 53, p. 580), held at Indianapolis, Ind., October 12-14, 1925, includes the following papers:

Presidential Address (pp. 41-44), by T. J. Strauch; Health Ordinances Pertaining to Milk (pp. 45-50), by F. D. Holford; Report of Committee on Communicable Diseases Affecting Man—Their Relation to the Milk Supply and to the Public Health (pp. 51-61), by J. L. Rice; A Study of Commercial Pasteurizers in Boston (pp. 62-69), by A. R. Tolland; Sanitary Efficiency in Country Milk Receiving Stations (pp. 70-92), by R. S. Smith; The Relation of Economy of Milk Production to Dairy Sanitation (pp. 93-101), by C. W. Larson; Report of Committee on Bovine Diseases—Their Relation to the Milk Supply and to the Public Health (pp. 102-108), by C. D. Pearce; An Infant in the Dairy Industry (pp. 109-114), by H. E. Van Norman; The Progress of Tuberculosis Eradication Work (pp. 115-127), by J. A. Kiernan; What the Dairy Councils Are Doing (pp. 128-134), by M. O. Maughan; Report of Committee on Transportation of Milk and Milk Products (pp. 135-150), by R. S. Smith; Economic Laboratory Control of Milk Quality by Milk Distributors (pp. 151-155), by C. L. Roadhouse; Report of Committee on Sanitary Control of Ice Cream (pp. 156-162), by R. E. Irwin; Veterinarian or Dairyman, Which? (pp. 163-168), by A. D. Burke; Report of Committee on Remade Milk (pp. 169-175), by J. H. Shrader; Report of Committee on Methods of Bacterial Analysis of Milk and Milk Products (p. 176), by G. E. Bolling; A Detail in the Mojonnier Testing of Ice Cream (pp. 177, 178), by C. S. MacBride; Some Heat-Resisting Streptococci Found in Market Milk (pp. 179-183), by H. O. Way; Report of Committee on Serving Milk in Schools (pp. 184-186), by W. P. B. Lockwood; The Health Department and the Milk Dealer (pp. 187-192), by W. B. Palmer; Report of Committee on Food Value of Milk and Milk Products (pp. 193-204), by I. V. Hiscock; A Welfare Department of the Dairy Industry (pp. 205-210), by S. H. Greene; Report of Committee on Methods of Obtaining a Satisfactory Quality of Raw Milk for Pasteurization (pp. 211-213), by E. L. Moore; Certified Milk (pp. 214-217), by W. A. Shoults; Report of Committee on Milk Plants (pp. 218-222), by C. S. MacBride; Some Phases of the Methylene Blue Question (pp. 223-229), by H. A. Harding and A. R. Ward; Cooperative Milk Inspection in the Improvement of Milk and Other Dairy Products (pp. 230-233), by R. F. Leslie; A Municipal Milk Supply from Tuberculin-Tested Cattle (pp. 234-238), by F. C. Rath; Field Notes (pp. 239-243), by C. A. Krause; The Methylene Blue Test as an Adjunct to Milk Inspection—Second Year's Report (pp. 244-247), by C. H. Chilson; Methods of Delivering Milk in Some European Cities (pp. 248-256), by W. A. Stocking; A Proposed Control Basis for Cream Supplies (pp. 257-261), by J. H. Shrader; Report of Committee on Pasteurization (pp. 262-279), by W. H. Price; and Present Status of Pasteurization (pp. 280-286), by E. Kelly.

Milk, butter, and dairy products, P. Dornic and A. Chollet (*Lait, Beurre, et Dérivés. Paris: J. B. Baillière & Sons, 1926, pp. 528, figs. 116*).—The first portion of this book deals with the physical, chemical, and bacteriological properties of milk. The utilization of milk products is later taken up, including the various manufacturing processes, such as pasteurization, homogenization, condensing, and preparation of fermented drinks. The manufacture of butter, analyses, and defects are also presented. Notes on various sorts of dairy legislation are included.

The restoration of the milk supply of a large French city, P. Saint Olive and R. Guyot-Sionnest (*Le Ravitaillement en Lait d'un Grande Ville Française. Lyon: Union du Sud-Est des Syndicats Agricoles, 1926, pp. 131, pls.*

2, fig. 1).—The results are given of a study of the milk supply, distribution, and consumption in the city of Lyon, France, after the war.

Good milk and good butter, H. Babet-Charton (*Bon Lait, Bon Beurre. Paris: Libr. Agr. Maison Rustique, pp. 80, figs. 36*).—A popular presentation of the production of butter, including reference to the variability in the composition of milk and sanitary milk production.

Influence of the milk on the starter made from it, M. P. Baker and B. W. Hammer (*Iowa Sta. Research Bul. 92* (*1926*), *pp. 75–95*).—Studies of the comparative quality of starters made with milk from individual cows and with milk from different sources are reported. In making the comparisons the samples of milk were pasteurized in small bottles and equal amounts of dilute suspensions of various starters added to portions of the individual milk samples. All were incubated at 70° F. and cooled, after which they were judged as to flavor and aroma, and the acidity produced was determined by titration. The results showed considerable variation in the acidity produced by a given starter in milk from the different sources, and the direction of these variations were frequently consistent even for different starters.

The relation between the composition of the milk and the acidity produced, while somewhat irregular, indicated that milk high in total solids produced a relatively high acid content in the starter, but the cause was not direct, being due to the fact that high total solids indicate a high initial acidity and a high fat and ash content. The studies of aroma and flavor showed no great tendency for the milk of certain animals to produce superior starters regularly, except that off-flavors in the original milk resulted in a poor quality starter. There appeared to be no definite relation between the acidity developed and the score of the starters.

Starters prepared from mixed milk of individual producers gave similar results, except that there was less variation in the acidity produced and in the scores than was found in the samples from individual cows.

In other experiments various substances were added to the milk. These results showed that the additions of fat or water reduced the development of acid and materially lowered the score. Additions of lactose had somewhat the same effect. Additions of milk ash had no effect on acidity and only a slight effect on flavor. Thus, it appears that these substances in no way improved the quality of the starters.

The pasturization of milk, cream, and dairy by-products, W. F. Jones and A. H. White (*Canada Dept. Agr. Bul. 59, n. ser.* (*1926*), *pp. 22, figs. 13*).—This gives a discussion of the various methods of pasturizing milk, cream, whey, skim milk, and buttermilk, with special descriptions of the equipment.

Viscosity—its relation to quality, W. H. Martin (*Ice Cream Trade Jour., 22* (*1926*), *No. 1, pp. 54–56*).—A discussion of the influence of composition on viscosity and its relation to quality in ice cream, based mainly on the results of ice cream studies conducted at various experiment stations.

VETERINARY MEDICINE

The inspection stamp as a guide to wholesome meat, J. R. Mohler (*U. S. Dept. Agr., Misc. Circ. 63* (*1926*), *pp. [2]+18, figs. 13*).—This circular describes briefly the manner in which the Federal meat-inspection service operates; discusses the extent of Federal supervision over the meat supply and how producers, consumers, and the public generally may derive the greatest benefits; and points out, likewise, opportunities for supplementing Federal inspection with State or municipal inspection.

The Pharmacopoeia of the United States of America (*Philadelphia: J. B. Lippincott Co., 1926, 10. ed., pp. XLI+626*).—This tenth decennial revision (E. S. R., 36, p. 378), prepared by a committee of revision (E. F. Cook, chairman) on authority of the United States Pharmacopoeial Convention held at Washington, D. C., May 11, 1920, is official from January 1, 1926.

Developments in anthelmintic medication, M. C. Hall (*Amer. Jour. Trop. Med., 6 (1926), No. 4, pp. 247–260*).—A paper read by the author before the American Society of Parasitologists in December, 1925.

On the toxic action of carbon disulfide, II, III [trans. title], K. Muto (*Jour. Japan. Soc. Vet. Sci., 4 (1925), Nos. 2, pp. 89–99, fig 1; 3, pp. 235–244, fig. 1*).—The second and third reports, here presented (E. S. R., 52, p. 881), deal with experiments (2) On the Determination of the Minimal Lethal Dose in the Case of Very Acute Intoxication by Inhalation and (3) On the Determination of the Minimal Lethal Dose in the Case of Subacute Intoxication by Inhalation.

Comparative study on the resistance of erythrocytes of healthy domestic animals [trans. title], C. Kohanawa and A. Kadono (*Jour. Japan. Soc. Vet. Sci., 4 (1925), No. 3, pp. 289–299*).—This is a report of studies of the resistance of the red blood cells of 12 healthy domestic animals, including horses, cattle, swine, sheep, and goats, respectively, by the same method and under the same conditions.

The relation of wild animals to certain diseases of man, P. H. Manson-Bahr (*Vet. Rec., 6 (1926), No. 29, pp. 603–611*).—This is a summary of information on the subject presented to the section of comparative medicine of the Royal Society of Medicine. A list of helminths found in man and wild animals and references to the literature are included.

A laboratory epidemic in rats due to Gaertner's bacillus, N. D. Ball and C. Price-Jones (*Jour. Path. and Bact., 29 (1926), No. 1, pp. 27–30*).—This is an account of an epidemic among white and black-and-white rats in the animal house at the Graham Research Laboratories, London.

The rôle of the Twort-d'Herelle phenomenon in epidemics of mouse-typhoid, W. W. C. Topley, J. Wilson, and E. R. Lewis (*Jour. Hyg. [London], 24 (1925), No. 1, pp. 17–36, figs. 4*).—The authors' observations do not indicate that the dissemination of a bacteriophage is likely to have been the cause of the sudden decrease in the excretion rate of *Bacterium aertrycke*.

Eliminating a source of error in the laboratory diagnosis of rabies, E. K. Borman (*Amer. Jour. Pub. Health, 16 (1926), No. 5, pp. 467, 468*).—In this contribution from the Kentucky Experiment Station attention is called to the fact that red blood cells in or upon the brain tissue are potential sources of error in the laboratory diagnosis of rabies. A method for the destruction of these blood cells is described, and notes and explanations are appended in the discussion.

Rabies vaccine canine: "Single dose treatment," J. Reichel and J. E. Schneider (*Penn. State Vet. Med. Assoc. Proc., 40 (1923), pp. 61, 62*).—In an experiment conducted to determine whether or not a dead or noninfective vaccine was equal to a live or infective vaccine as an immunizing agent in the single dose treatment, 35 dogs ranging from 6 to 34 lbs. in weight were injected subcutaneously, and the results are briefly described. Fifteen of the 35 originally injected dogs died of various causes and minor derangements. After the injection of "street virus," only 1 of the 20 treated dogs developed rabies, 5 remained alive for more than 100 days and all 9 untreated dogs developed rabies.

Agglutination, cross-agglutination, and agglutinin absorption in tularaemia, E. FRANCIS and A. C. EVANS (*Pub. Health Rpts.* [U. S.], *41* (*1926*), *No. 26, pp. 1273–1295, figs. 3*).—A study of the blood serums of 120 cases of tularemia tested for agglutination of *Bacterium tularense* showed (1) a complete absence of agglutinins for *B. tularense* in the first week of illness, (2) the constant presence of agglutinins in the second week, (3) an abrupt rise in titer in the third week, reaching its maximum in the fourth, fifth, sixth, or seventh week, (4) a fall in titer in the eighth week, (5) a gradual decline thereafter until at the end of the first year the average titer of 17 cases was 1:136, (6) a persistence of agglutinins in long-recovered cases, and (7) the failure of agglutinins entirely to disappear in any case, even 10, 14, and 18 years after recovery.

It is concluded (1) that, on account of the frequent cross agglutination between *B. tularense* on the one hand and *B. abortus* and *Brucella melitensis* on the other, serums from suspected cases of tularemia and undulant fever should be tested for agglutination of *B. tularense* and either *B. abortus* or *B. melitensis*, unless the clinical history points definitely to a recognized source of infection for tularemia or undulant fever; (2) that a serum which shows a marked difference in titer for *B. tularense* on the one hand and for *B. abortus* or *B. melitensis* on the other can usually be classed by the higher titer as due either to tularemia or to one of the varieties of *B. melitensis;* and (3) that a serum which agglutinates all three organisms to the same or nearly the same titer should be subjected to agglutinin absorption tests.

Further experiments with the Gongylonema of cattle, H. A. BAYLIS, A. L. SHEATHER, and W. H. ANDREWS (*Jour. Trop. Med. and Hyg.* [*London*], *29* (*1926*), *No. 13, pp. 194–196*).—Experiments reported by the authors appear to indicate that there is no difficulty in transmitting the *Gongylonema scutatum* of cattle to sheep. It is difficult or impossible to transmit this organism to pigs.

Carbon tetrachloride in liver rot of sheep, R. F. MONTGOMERIE (*Jour. Compar. Path. and Ther.*, *39* (*1926*), *No. 2, pp. 113–131*).—In investigations of the efficiency of the pure drug, the author reports experiments with 172 sheep which indicate that it has a reliable anthelmintic action toward the mature liver fluke. A single administration of 1 cc. in soft gelatin capsule was a therapeutic dose for sheep affected with liver rot weighing up to 140 lbs. One-half cc. efficiently treated two sheep weighing 40 to 42 lbs., respectively, and 1 cc. in linseed oil was efficient in the case of a 39-lb. sheep. The absence of preparation for treatment by starving for a period did not influence the efficiency of a dose of 1 cc. The dose used did not destroy immature flukes infesting certain of the subjects at the time of treatment. In no case were symptoms indicative of toxic action observed.

In testing the toxicity of the pure drug, experiments were conducted with 9 animals. Doses as large as 50 cc., given in capsule without breakage, were perfectly tolerated by ewes that were advanced cases of liver rot. In no case did the drug prove lethal.

It is pointed out that the fluke experiments on the efficiency of the commercial drug suggested that its action against the common liver fluke is not constant and can not be relied on. It is thought that this variation may be due to a difference in the actual amount of carbon tetrachloride contained in each capsule. It appeared to be advisable to use the chemically pure drug in order to obtain consistent satisfactory anthelmintic action.

The efficiency of tetrachlorethylene in liver rot of sheep, R. F. MONTGOMERIE (*Jour. Compar. Path. and Ther.*, *39* (*1926*), *No. 2, pp. 132, 133*).—The author finds that tetrachlorethylene does not possess an anthelmintic action

toward the common fluke comparable with that of carbon tetrachloride. While the small series of experiments recorded do not justify the conclusion that this drug is of no value in the treatment of liver rot, the results obtained do not encourage further investigation of its value in this connection.

Lamb dysentery: An account of some experimental field work in 1925 and 1926, T. Dalling et al. (*Jour. Compar. Path. and Ther., 39 (1926), No. 2, pp. 148–163, figs. 4*).—The authors produced a condition apparently identical with naturally occurring lamb dysentery in young healthy lambs on a clean farm by the following methods: (a) Feeding material from the intestine of naturally affected lambs, (b) injecting similar material intravenously, (c) feeding either a mixture of *Bacillus welchii* and *B. coli* or a culture of virulent *B. welchii*, and (d) intravenous inoculation of *B. coli* followed by the feeding of *B. welchii* culture.

In all except the last method (where no serum experiments have been done) the use of *B. welchii* antiserum prevented infection. It was found impossible to infect lambs through the umbilicus except in one case. In inoculations with a prophylatic containing *B. welchii* toxin antitoxin and *B. coli* vaccine, 3.06 per cent of 5,760 lambs inoculated in the autumn and spring died of lamb dysentery. Of 2,509 lambs born of 2,248 control uninoculated ewes, 16.06 per cent died of lamb dysentery. When a single spring inoculation was given the figures were for inoculated ewes 7,223, lambs 8,497, morality 5.34 per cent; control ewes 4,633, lambs 5,131, mortality 11.59 per cent. Among 456 lambs injected with double serum 1.9 per cent died, while among 425 control lambs on the same farms the mortality was 22.6 per cent.

The organism of contagious agalaxia of the sheep and goat [trans. title], J. Bridré and A. Donatien (*Ann. Inst. Pasteur, 39 (1925), No. 12, pp. 925–951; abs. in Trop. Vet. Bul., 14 (1926), No. 2, pp. 70, 71*).—The authors report having succeeded in isolating and cultivating a filterable but visible organism.

Vaccination of poultry, S. H. McNutt (*Jour. Amer. Vet. Med. Assoc., 69 (1926), No. 4, pp. 472–477*).—In work at the Iowa Experiment Station with a number of flocks of chickens, consisting of 670 individuals, one-half of each flock was injected with commercial, mixed-infection bacterins, recommended for the prevention and treatment of cholera and secondary infections of chickens, including canker, pox, roup, etc. In every flock the losses of treated birds equaled or exceeded the losses of the untreated.

In another series of flocks, consisting of 394 birds, a similar experiment was carried out, using pox-virus vaccine. An outbreak of pox and canker occurred, and the disease was as prevalent among treated as among untreated birds. The death loss was greater in the untreated flocks, but the difference was slight, being only 1 bird more per 100 of those used.

Hemorrhagic septicemia aggressin, injected into healthy fowls, furnished no increased protection against virulent cultures of the organism of fowl cholera, as compared with fowls not injected; in fact, the resistance may have been lowered, since 53 per cent of the treated birds died, as compared with 45 per cent of the untreated. Fowl typhoid bacterins, used in flocks aggregating 725 birds, failed to show any effect sufficient to recommend its use.

The vaccine therapy of epithelioma contagiosum of the fowl [trans. title], B. Galli-Valerio (*Schweiz. Arch. Tierheilk., 67 (1925), No. 9, pp. 243–247, figs. 2; abs. in Jour. Compar. Path. and Ther., 38 (1925), No. 2, pp. 110, 111*).—This is a report of studies conducted in Switzerland, where the disease is comparatively rare, the author having encountered but a single case in the course of 27 years. He found epithelioma to be readily transmissible from fowl to fowl or pigeon to pigeon, but has been unable to transmit epithelioma to man or mulluscum to fowls.

B. aertrycke as the etiological agent in a disease affecting squabs, F. R. BEAUDETTE (*Jour. Amer. Vet. Med. Assoc., 68 (1926), No. 5, pp. 644-652*).—This is a report of studies at the New Jersey Experiment Stations in 1925 of an outbreak which started in June, 1924, in the vicinity of Camden, N. J. The author isolated an organism, which can not be differentiated from *Bacillus aertrycke*, from the heart-blood, liver, kidney, brain, and unabsorbed yolk sac of squabs dying of a disease known as megrims.

"The fermentation reactions of the organism are identical with those of *B. paratyphosum* B. By means of agglutinin-absorption tests, the organism was shown to be agglutinatively different from *B. paratyphosum* B and *B. suipestifer*. The organism was found to be agglutinatively identical with *B. aertrycke*. The organism was found to be the same as a pigeon typhus strain, isolated probably by Mobler. The similarity of the outbreak with those reported by others indicates that this disease is not uncommon. Transmission of the infection through the egg seems possible, since the organism was isolated from an unabsorbed yolk, the disease attacks very young squabs, and because sanitary precautions fail to prevent its constant appearance."

The etiology of a canary bird epizootic, F. R. BEAUDETTE and P. R. EDWARDS (*Jour. Bact., 12 (1926), No. 1, pp. 51-55*).—This is a contribution from the New Jersey Experiment Stations and Yale University. A cultural, morphological, and serological study of a canary bird epizootic occurring among some 200 caged birds showed the causative agent, a member of the paratyphoid-enteritidis group, to be identical with the type designated by some as *Bacterium aertrycke* and by others as *B. pestis-caviae*.

B. aertrycke infection in canary birds and parrots, F. R. BEAUDETTE (*Jour. Amer. Vet. Med. Assoc., 68 (1926), No. 5, pp. 642, 643*).—This is another contribution from the New Jersey Experiment Stations.

AGRICULTURAL ENGINEERING

Principles of soil mechanics, I–VIII, C. TERZAGHI (*Engin. News-Rec., 95 (1925), Nos. 19, pp. 742-746, figs. 5; 20, pp. 796-800, figs. 3; 21, pp. 832-836, figs. 4; 22, pp. 874-878, figs. 6; 23, pp. 912-915, figs. 6; 25, pp. 987-990, figs. 4; 26, pp. 1026-1029, figs. 2; 27, pp. 1064-1068*).—A series of eight reports of studies on the engineering properties of soils, conducted at the American Robert College, Constantinople, Turkey, are reported.

I. *Phenomena of cohesion of clay*.—These studies indicate that the cohesion of clay is due to two factors. The first of these is the pressure exerted by the surface tension of the capillary water, the intensity of which exceeds all other forces in soils. Swelling of clay is considered to be nothing more or less than the purely elastic expansion produced by the elimination of the surface tension of capillary water. Local evaporation of the capillary water or local flooding of the surface of clay deposits produces secondary stresses, the intensity of which is far greater than the weight of the heaviest structures, and which were found to be the primary cause of many vast soil displacements known as earth slips.

The second factor in the cohesion of clay consists in the fact that the properties of the water contained in voids of a width less than 0.0001 mm. are not identical with those of ordinary water. In such voids viscosity and surface tension are increased in inverse proportion to the diameter of the voids, and the water loses its ability to evaporate. Thus the capillary water of the clays is, to a certain degree, solidified by the influence of the forces exerted by the molecules of the solid matter. Due to this fact, the capillary

pressure assumes far greater values than it would if the surface tension of the capillary water had its normal value.

II. *Compressive strength of clay.*—These studies showed that the modulus of elasticity of clay in compression determined from cube tests at different moisture contents has a constant ratio to the capillary pressure. Capillary pressure was found to play the same part in the physics of clays as does intrinsic pressure in the physics of solids. The elastic properties of the clays are therefore considered to be qualitatively identical with those of granular solids. It is concluded that the minimum requirement for describing a clay from the engineering viewpoint consists in presenting data on water content, specific gravity of the solid matter, and the lower limits of the plastic and of the liquid states of the clay.

III. *Determination of permeability of clay.*—Studies of the validity of Darcy's law, Slichter's formula, and Hazen's observations with reference to clay and sand showed that the Darcy law is valid even for the semisolid state, and holds for percolation through clay of plastic consistency. Distinct departures from Darcy's law could be noticed only for semiliquid clays. Reducing the hydraulic grade from 50 down to 10 or 15 caused a rapid decrease of the coefficient of permeability, and this coefficient was fairly constant only at low heads. This phenomenon is explained by the fact that the structure of a semiliquid clay is honeycombed. Results obtained in certain evaporation tests indicated that the physical constants of the water may change when the capillary channels of a shrinking clay become reduced to a certain size. To provide for such changes in viscosity the formula for permeability of clay was modified to

$$k=\left(\frac{C}{v_o}\right)\left(\frac{v_o}{v_t}\right)\frac{(e-0.15)^{11}(1+e)}{(e-0.15)^8+\frac{c}{d^8_w}}d^2_w.$$

In this formula k is the coefficient of permeability, C and c are constants depending on the nature of the grains as well as their size, v_o and v_t are the coefficients of viscosity of the water at 10° C. and at a temperature of t, respectively, d_w is the effective size of the grains of clay, and e is the void ratio.

IV. *Settlement and consolidation of clay.*—These studies showed that the consolidation of clay is the result of a decrease of moisture content under load. They indicate that the compression proceeds exceedingly slowly from the surface of the layer toward the interior. This is considered to explain the gradual increase of the setttlement of structures resting on the surface of strata of plastic clay. The results of studies of settlement are taken to indicate that in order to compare two clays as to settlement, it is necessary to submit a sample of each to a test of such a nature that its outcome will depend on nothing but the value of the ratio of the slope of the pressure-moisture curve and the coefficient of permeability of the clay.

V. *Physical differences between sand and clay.*—These studies showed that there is no essential difference existing between sands and clays other than those in grain size and shape. However, these two differences were found to be fully adequate for explaining the more obvious distinguishing features of the two materials. It was found that the volume of voids of clay may be 98 per cent of the total volume, while the volume of voids in sand is about 50 per cent at the maximum. Clay was found to shrink on drying while sand did not. Clay showed a very marked cohesion depending on the moisture content, while sand showed a negligible cohesion when clean. Clay was found to be plastic and sand was not. Clay was found to compress very slowly when a load was

applied to the surface and was very compressible, while sand compressed almost immediately when a load was applied to the surface and was far less compressible than clay. In connection with the listed differences, loading of the horizontal surface of a water-soaked layer of sand was found to produce an almost instantaneous settlement, because there was little resistance to the escape of the excess water from the compressed material. On the other hand, the low permeability of the clay resulted in an enormous resistance to the escape of the capillary water and therefore settlement under load proceeded slowly.

VI. *Elastic behavior of sand and clay.*—These studies included compressibility and elasticity tests of sand, investigations of expansion and resaturation and of the ideal sand cube, and of the effect of lateral expansion. It was found that while Poisson's ratio for clay is approximately identical with that of metals, its value for sand corresponds to the average Poisson's ratio for crystalline rocks.

VII. *Friction in sand and in clay.*—These studies showed that the quantitative side of every earth pressure phenomenon depends on the intensity of the frictional resistance acting within the soil. An attempt to characterize the phenomena of sand and clay friction and to indicate their quantitative features indicated that friction between smooth and absolutely clean surfaces of solid bodies is a purely physicochemical process and is caused by direct molecular interaction. Friction between imperfectly smooth surfaces of solid bodies involves not only these physicochemical causes but also a filelike action of each surface on the other. In sand the friction coefficient depends not only on the properties of the grains and the structure of the sand, but also on the nature of the process which causes the slip and of that which preceded the slip. It has no definite value, but may be anywhere between the coefficient of internal friction and the coefficient of internal resistance. In clay the friction coefficient for medium and high pressures is remarkably constant. For low pressures, however, the value of the coefficient increases with decreasing pressure, because initial friction plays an important part, amounting to about 20 gm. per square centimeter. Rapid change of pressure produces a positive or negative hydrostatic pressure in the liquid component of the clay. The coefficient of friction does not assume its normal value until the hydrostatic pressure has become zero throughout the whole mass. In the preceding stage of the process the coefficient of friction may have any positive value, and is a function of the time.

VIII. *Future development and problems.*—A brief statement of the origin and history of experimental study of soils is given, and the objectives of future work in soil mechanics are outlined.

Irrigation, with special reference to the economic use of water, H. W. Turpin (*Union So. Africa Dept. Agr. Jour., 11 (1925), No. 5, pp. 436–454, figs. 2*).—Data from various sources on the irrigation of different crops are briefly summarized, much of which is taken from work conducted by experiment stations in this country.

Duty of water investigations (*New Mexico Sta. Rpt. 1925, pp. 20–23*).—Data from measurements of duty of water for cotton, rye, corn, wheat, cantaloupes, chili, grapes, cabbage, and alfalfa, conducted in cooperation with the U. S. D. A. Bureau of Public Roads, are briefly presented.

Duty and effect of duty of water on alfalfa (*New Mexico Sta. Rpt. 1925, pp. 25–27*).—A continuation of studies made in cooperation with the U. S. D. A. Bureau of Public Roads is briefly presented (E. S. R., 51, p. 483), the results of which so far seem to indicate that the shorter length of plats with a small irrigation head required about one-fourth less water to produce about 10 per

cent less alfalfa than the longer plats. From the standpoint of the water used, about 12 per cent more alfalfa could be produced per acre-inch on the shorter plats than on the longer plats.

Rate and cause of rise of ground water in the Mesilla Valley [N. Mex.] (*New Mexico Sta. Rpt. 1925, pp. 23–25*).—A continuation of work done in cooperation with the U. S. D. A. Bureau of Public Roads is briefly reported. The exact cause for the rise in the water table in the valley is apparently not yet definitely known, but it is attributed to various obstructions in the drainage ditches and to the increased acreage brought under cultivation, which has necessitated the use of a large quantity of water.

Public Roads, [June, 1926] (*U. S. Dept. Agr., Public Roads, 7 (1926), No. 4, pp. 69–92+[2], figs. 37*).—This number of this periodical contains the status of Federal-aid highway construction as of May 31, 1926, together with the following articles: Motor Truck Impact as Affected by Tires, Other Truck Factors, and Road Roughness, by J. A. Buchanan and J. W. Reid (see below); Maximum Stream Flow, by C. E. Grunsky; Survey of Soils and Pavement Conditions in Progress in Michigan, by V. R. Burton; and Tests of Concrete in Tension, by A. N. Johnson.

Motor truck impact as affected by tires, other truck factors, and road roughness, J. A. Buchanan and J. W. Reid (*U. S. Dept. Agr., Public Roads, 7 (1926), No. 4, pp. 69–82, figs. 32*).—The results of cooperative tests by the Bureau of Public Roads, the Society of Automotive Engineers, and the Rubber Association of America are reported, which were designed especially to develop information with respect to the influence of various types of tires, certain elements of vehicular design and equipment, the loading capacity and speed of the vehicles, and the roughness of the road surface. An attempt has also been made to determine the stresses induced in the road surface.

It has been found that as the static load increases the road impact reaction increases and the ratio of road impact reaction to static load decreases. Thickness and narrowness of tread rubber have been found desirable in reducing road impact reaction. Increasing the thickness or profile height of rubber has a very marked effect in reducing road impact reaction in both single and dual mountings. Dual mounting was found to cause heavier impact forces than the corresponding single mounting of the same total load carrying capacity. Appreciable variation of cross-sectional rubber or breaks in its continuity caused heavy repeated impacts to be delivered to the road. It was found that dual mounted tires should always be mounted with the tread design staggered.

Energy requirements of farm work [trans. title], K. v. Meyenburg (*Technik Landw., 5 (1924), No. 9, pp. 165–171, figs. 3*).—Data on the power requirements of agricultural operations in Germany are briefly presented which indicate that under certain conditions mechanical power is cheaper than man or animal power.

Cost of agricultural power [trans. title], B. Victor (*Technik Landw., 5 (1924), No. 9, pp. 171–173, figs. 5*).—Comparative data on the cost of power for agricultural operations from steam engines, crude oil engines, gasoline engines, and portable electric motors are graphically reported. Engines and motors of from 6 to 8, 10 to 12, 15 to 20, and 25 to 30 h. p. were tested, as were also 2 h. p. gasoline engines and electric motors.

The power cost per hour curves for the different machines showed a marked similarity. Electricity was found to be the most efficient power source where small power units were required for short periods of time, although it was approached closely by the crude oil engine in this respect. However, elec-

tricity was not always the most efficient source of power, being frequently inferior to the crude oil and gasoline engines, especially with the larger power units and longer periods of operation. It was even less efficient on an annual basis than steam for machine units of from 15 to 30 h. p. The most uniformly efficient source of power on an annual basis was the gasoline engine, followed closely by the crude oil engine.

The data are taken to indicate, however, that efficiency in the use of power in German agricultural operations depends not so much on the source of the power as on the conditions under which it is used and the extent to which they are met.

Progress on the South Dakota farm electric test line at Renner, R. L. PATTY (*C. R. E. A. Bul. [Chicago], 2 (1925), No. 11, pp. 1-7, figs. 7*).—In a contribution from the South Dakota Experiment Station a description is given of the work on the use of electricity in agriculture by the station, and the progress of experiments on the test line at Renner is reported.

It has been found that the total cost of electric service on this farm line will include the fixed charge of $8 per month, the interest and depreciation on the stub line, on the wiring and fixtures of the building, and on the electric motors and appliances, plus the energy rates of 5 cts. and 3 cts. per kilowatt hour. The average amount of energy used at each farm during January was 41.12 kw. hours. It increased to 50 kw. hours during February, and then remained at about 45 kw. hours per month until August. It then increased and reached 117.5 kw. hours in December. It is noted that in December, when the largest amount of energy was used, the average electric light bill was relatively small, although almost three times as much energy was used as in the previous January.

Electrical protection and safety apparatus for agricultural use [trans. title], C. H. DENCKER (*Technik Landw., 7 (1926), No. 1, pp. 6-11, figs. 16*).—Safety appliances for use in farm electrical installations are described and illustrated, and data from tests of such things as fuses, switches, grounding devices, automatic circuit breakers, etc., are reported.

Dust explosions, P. BEYERSDORFER (*Staub-Explosionen. Leipzig: Theodor Steinkopff, 1925, pp. VIII+125, figs. 14*).—This book deals with dust explosions and their prevention, more especially in Europe, and draws attention to the work on this subject which has been in progress in this country. It contains chapters on the frequency and extent of dust explosions, dust, nature of the explosion, the dangerous properties of dusts, dangerous forms of energy, mixed dust and gas explosions, explosions of decomposed dust, action of dust explosions, the danger of dust accumulations, and the prevention of dust explosions.

Wind motors: Function of counter weights applied to the pump rod [trans. title] (*Rev. Facult. Agron. La Plata, 3. ser., 15 (1923), No. 2, pp. 66-82, figs. 11*).—A mathematical analysis of the functions of counter weights attached to the pump rod of a windmill-driven pump is presented. According to this analysis counter weights facilitate the movement of elevation of the motor as well as compensate for the weight of the pump rod. They are considered to be especially important for deep well pumps, and promote uniform and regular movement, reduce vibration, and lengthen the life of the motor.

A process for the reclamation of crankcase oil, C. D. MILLER (*Bus Transportation, 5 (1926), No. 1, pp. 6-9, figs. 7*).—In a contribution from the Alabama Experiment Station an explanation is given as to why uncertain results have been obtained in efforts to purify used crankcase oil by certain processes, and a two-stage method which promises more successful results is outlined.

In the first part of this method the solid matter is removed, and in the second the absorbed motor fuel is removed to restore the oil to its proper

viscosity. The first part is essentially a washing with hot water containing washing powder in solution. The absorbed motor fuel is removed and the oil returned to its proper viscosity by placing the cleaned oil in a tank in which it is heated to a temperature of 350 to 380° F. and steam blown through it. Both the steam and the high temperature are essential to the removal of the heavy ends of the fuel. With the steam passing through and opening up the mass of liquid, the fuel ends are readily and completely removed.

Farm machinery: Its purchase, care, operation, and adjustment, R. I. Shawl (*Illinois Sta. Circ. 309 (1926), pp. 56, figs. 32*).—Practical information on the subject is given.

Depreciation of farm machinery, L. Wallace (*Agr. Engin., 7 (1926), No. 2, pp. 49, 50, 66, fig. 1*).—Data from studies conducted by the Iowa Agricultural Experiment Station in cooperation with the Iowa Engineering Experiment Station are briefly summarized. The purpose of the work is to establish the history of worn-out farm machines and of machines which have been in service longer than one year. No conclusions are drawn.

Reducing grain losses in threshing, I. P. Blauser (*Illinois Sta. Circ. 311 (1926), pp. 20, figs. 3*).—The results of investigations of the losses of grain during threshing are briefly presented, together with practical suggestions for efficient threshing machine operation and a grain separator trouble chart. Tests made on 20 threshing machines showed that the average grain loss was 0.95 per cent. Eight of the machines were losing more than 1 per cent. Subsequent tests of 53 machines showed that the average loss was 1.36 per cent. A proper adjustment of 23 of these machines reduced the average loss to 0.7 per cent.

Test of a wedge share for a spring tooth cultivator [trans. title], Martiny (*Technik Landw., 6 (1925), No. 12, pp. 21–23, figs. 2*).—Tests of a share for a spring tooth cultivator having a flaring wedge shaped cutting edge and a triangular or flat wedge shaped cross section from the edge up to a high point on the shank are briefly reported. This tool was found to prevent almost completely the turning up of the noodle shaped strips usually turned up by flat shares in the more plastic soils, owing to its wedge action. A better seed bed is thus obtained. The draft of the wedge share was slightly greater than that of the flat share.

Silo building, L. E. Hazen (*Oklahoma Sta. Circ. 60 (1926), pp. 7–20, figs. 12*).—Practical information on the planning and construction of silos for Oklahoma conditions is given, together with working drawings and tabular structural data.

The improved semi-monitor poultry house, D. C. Kennard (*Ohio Sta. Bimo. Bul., 11 (1926), No. 3, pp. 120–123, figs. 2*).—Practical information is given on the construction of an improved semimonitor poultry house, together with a working drawing.

A portable summer colony house for pullets, D. C. Kennard (*Ohio Sta. Bimo. Bul., 11 (1926), No. 3, pp. 115–119, figs. 5*).—Practical information on the construction of a portable summer colony house for pullets adapted to Ohio conditions is presented, together with working drawings and a sample bill of materials.

RURAL ECONOMICS AND SOCIOLOGY

Bibliography of publications on agricultural economic conditions (*Bibliographie d'Enquêtes concernant les Conditions Économiques des Agriculteurs. Rome: Inst. Internatl. Agr., Bur. Insts. Écon. et Sociales, 1926, pp. 95*).—A bibliography of books, bulletins, and articles published by governments, institutions, associations, and individuals.

[Rural economics investigations at the Ohio Station] (*Ohio Sta. Bimo. Bul., 11 (1926), No. 3, pp. 124–127*).—Results of work in rural economics are given.

Farm products consumed by the farm family, J. I. Falconer.—A table is given showing the average quantities of different farm products consumed in 1923 on 38 farms averaging 4.3 adults to a family. Farm and city values of the items are included, aggregating $578.59 and $1,203.97, respectively.

Index numbers of crop production in Ohio, D. F. Christy.—Following the method used by Day,[1] and including corn, wheat, oats, barley, rye, buckwheat, potatoes, hay, and tobacco, index numbers of crop production have been computed for the years 1881 to 1925, inclusive.

Cost of living in farm homes of Delaware County, Ohio, C. E. Lively.—A table is given showing the average expenditures for the year ended October 1, 1923, of 383 farm families, averaging 4.1 persons each, by tenure groups, and values purchased and furnished by the farm. Of the total costs 41.5 per cent was contributed directly by the farm as food, rent, and operating expense.

Index numbers of production, wages, and prices, J. I. Falconer.—A continuation through February, 1926, of the index numbers previously noted (E. S. R., 55, p. 82).

The field of land utilization, L. C. Gray (*Jour. Land and Pub. Utility Econ., 1 (1925), No. 2, pp. 152–159*).—Land utilization is defined as "that branch of land economics which comprises the study of the land resources of a nation or other geographical unit from the standpoint of their economic significance with a view to determining for what and how they may be most effectively employed."

The differentiation of land utilization from the general field of the economics of production rests intrinsically upon the economic peculiarities of land as a factor of production, i. e., its special juristic position as a form of property toward which there is a distinctive psychological attitude, its being a definite category in economic evolution, the fact that its conservation is peculiarly vital to national greatness and continuity, its being a basis of distinctive and characteristic public policies, and the fact that its valuation is characterized by certain peculiarities.

The distinctive task of land utilization is to allocate properly the surface land resources of a nation among the competing uses and presupposes the desirability and possibility of agricultural expansion. Land classification is a prerequisite of a definite policy of utilization. Two methods of classification are in use at present, the intensive survey of an entire region as used by the Michigan Land Economic Survey, and the method of the U. S. Department of Agriculture committee on land utilization, which consists of bringing together and interpreting data gathered by Federal, State, and other agencies, and supplementing this by field studies of the sampling type.

Some of the theoretical problems of land utilization are, how to determine the margins of utilization between uses, how such determination is affected by the perishability of the use-bearer, to what extent a nation should consider the discount on the future in formulating a utilization policy, what is the point of most economical intensity of use for the various possible uses, what criteria should determine the political and economic objectives of a nation as to the use of its land, and how far different methods of taxation influence utilization under different uses.

Note on the creation of allotments (*Rome: Internatl. Inst. Agr., 1925, pp. 14*).—An allotment is defined as a plat of land, not attached to a dwelling house, assigned to or rented by a rural or industrial worker for cultivation or the

[1] An Index of the Physical Volume of Production, E. E. Day, Rev. Econ. Statis., 2 (1920), No. 9, pp. 246–259.

rearing of small livestock during his spare time. The object of allotments is to add to the worker's subsistence, furnish temporary resources to him in times of unemployment, afford experience looking to the acquisition of a small holding, afford him a change of occupation, recreation, and outdoor work, and to act as a counterattraction to the public house.

Legislation, methods of providing allotments, tenure of allotments, and the assistance furnished allotment holders in various European countries and the United States are described briefly.

Wheat exporting from the Pacific Northwest, J. B. WATKINS (*Washington Col. Sta. Bul. 201 (1926), pp. 4–38, figs. 6*).—A brief history of the marketing of wheat from 1825 to 1900 is given, followed by a detailed description of the marketing of wheat and flour from 1900 to 1925, a discussion of the competition met in the important foreign and domestic markets, and a summarization of the more important tendencies and factors affecting the exportation of wheat to different sections of the United States and to foreign countries.

Marketing lettuce, C. W. HAUCK (*U. S. Dept. Agr. Bul. 1412 (1926), pp. 45, figs. 24*).—This is a general study of the marketing of lettuce in the United States, including a description of the producing areas, varieties, methods of harvesting, grading and packing, loading and shipping, carload movements and distribution from different sections, preferences in consuming markets, prices and the factors entering into them, sales practices, and the Federal services in marketing. A list of Federal and State publications on harvesting and marketing is included.

Marketing western boxed apples, G. B. FISKE and R. R. PAILTHORP (*U. S. Dept. Agr. Bul. 1415 (1926), pp. 96, figs. 33*).—The various steps and methods used in harvesting, packing, transportation, storage, distribution, marketing, etc., of boxed apples from the western part of the United States are described. Features of the leading city markets, market preferences, price tendencies, costs of marketing, and the foreign trade are discussed. Statistical tables and a list of Federal publications are included.

Marketing barreled apples, G. B. FISKE (*U. S. Dept. Agr. Bul. 1416 (1926), pp. 100, figs. 26*).—This bulletin gives information for the barreled apple industry of the eastern part of the United States similar to that given above for the boxed apple industry.

The world wheat situation from December, 1925, to March, 1926, J. S. DAVIS ET AL. (*Wheat Studies, Food Research Inst. [Stanford Univ.], 2 (1926), No. 6, pp. 203–236, figs. 8*).—A continuation of the studies previously noted (E. S. R., 54, p. 884), including a study of supply and demand, visible supply, international trade, prices, carryovers, and prospects for the 1926 crop.

The agriculture of the Eastern Shore country, P. F. GEMMILL (*Econ. Geogr., 2 (1926), No. 2, pp. 197–212, figs. 21*).—The soils, climate, present status of agriculture and manufacturing, and the marketing facilities of the Delaware-Maryland-Virginia peninsula are described. At present corn and wheat growing, orcharding, dairying, and truck farming are the chief agricultural occupations, with cattle, sheep, hogs, and poultry raising as incidentals. The low cost of land, the accessibility to numerous large markets, the long growing season, and the well-distributed rainfall favor this section's becoming one of the foremost trucking sections of the United States.

Considerable attention has been given to producers' associations in this section, but much wider organization and development are needed for marketing, canning, and obtaining supplies.

Cotton production in Texas, L. P. GABBARD and H. E. REA (*Texas Sta. Circ. 39 (1926), pp. 3–23, figs. 13*).—The more outstanding facts relative to the growth and development of the cotton industry in Texas are set forth in this circular.

The area, soil, climate, acreage, yields, and dependability of crops are described for the four principal cotton-growing areas of the State. Possibilities for future expansion in acreage are discussed.

Sugar production of Czechoslovakia, B. C. Engle (*Econ. Geogr., 2 (1926), No. 2, pp. 213–229, figs. 33*).—Czechoslovakia produces 14 per cent of the beet sugar of the world. This article discusses the soil, climate, and the economic, social, and political conditions that have aided the development of the sugar industry to its present high status, its organization and markets, and the relation of the sugar industry to other industries.

Agricultural survey of South America: Argentina and Paraguay, L. M. Estabrook (*U. S. Dept. Agr. Bul. 1409 (1926), pp. 91, figs. 19*).—This bulletin is one of the series of agricultural surveys of foreign countries, previously noted (E. S. R., 55, p. 287), and contains an analysis of the agricultural situation in each of the countries.

The character and distribution of South American trade, C. F. Jones (*Econ. Geogr., 2 (1926), No. 2, pp. 143–167, figs. 30*).—Three significant facts concerning South American trade are noted: (1) While three-fourths of the continent is tropical, the temperate section supplies three-fourths of the exports and practically monopolizes the imports, (2) about 90 per cent of the trade of the 10 republics is outside of the continent, and (3) about 73 per cent of the exports come from the farms and ranges.

The South American trade has increased from $1,771,000,000 in 1910 to $2,787,000,000 in 1921–1923, of which amounts 17 per cent and 27 per cent, respectively, were with the United States. Of the imports from the United States in 1921–1923, 80 per cent were iron, steel, machinery, textiles, petroleum and forest products, and other manufactured products.

The possibilities of commercial expansion in South America are great, as the continent has vast vacant areas of rich mineral deposits and fertile agricultural lands which will provide for large increases in population and can furnish foodstuffs and raw materials for the manufacturing nations of the world. The development of these will demand the importation of more manufactured wares.

The soils, climate, industries, population, and transportation facilities of the several republics are described.

Revolutionizing the existing agricultural practices of China, F. H. Liu (*Chinese Students' Mo., 21 (1926), No. 4, pp. 34–44*).—Industrialization of the southern and most densely populated provinces of China will necessitate changes in the present agricultural practices. The 104,000,000 acres of cultivated lands are now feeding approximately 2 persons per acre as compared with 5 acres to each person in the United States. The shifting of labor to the cities, by decreasing agricultural labor and increasing consumption, the higher standards of living both in the cities and in the country, and the immense reduction in the amount of night soil available due to sanitary regulations in the cities, will necessitate making considerable change in the present farm practices. Combined livestock and grain farming, or dairy and grain farming, on a 6-mow (1-acre) farm is suggested as the probable future farm practice, as this will permit use of feeds not directly utilized by humans, provide manure, permit steady employment of labor, stabilize income, and encourage education and progressive farming.

The northern provinces have an area utilizable for food production of approximately 5 acres per capita for the entire population of China. This area can be used for food production as the southern provinces turn to industries.

The co-operative organisation of agriculture, H. C. Powell (*Farmers' Gaz. [Pretoria], 5 (1926), Nos. 54–58, pp. 8–11 each; also in Transvaal Univ. Col.,*

Pretoria, Bul. 7 (1926), pp. 28).—The theory and principles of cooperative organizations are discussed, with special reference to South African conditions. Compulsory cooperation as provided for in the amendment of 1925 to the Cooperative Societies Act of 1922 is deemed an unsound and dangerous doctrine, as is also government interference in cooperative organizations. The advantages that may result from cooperation, some of the managerial difficulties, and the limitations of cooperative organization are noted in brief, also the agricultural development and economic changes that have made cooperation essential.

Rural community organizations handbook, J. H. KOLB and A. F. WILEDEN *(Wisconsin Sta. Bul. 384 (1926), pp. 92).*—The methods, plans, and activities that may be employed by different kinds of local organizations for "making the community a better place for rural folks" are outlined. After briefly discussing some types of community organizations, how to select the right type, and the essentials for success, the book is given over to sections discussing various kinds of programs and activities. Suggestive forms of organizations, sample programs, etc., together with citations of source materials for each type of activity, are given.

Surveying your community, E. DES. BRUNNER *(New York: George H. Doran Co., 1925, pp. 109, figs. 6).*—This is a handbook of methods for rural churches in organizing and conducting surveys and preparing, presenting, and utilizing the results. Forms of schedules for different types of surveys are included.

Children working in the sugar beet fields of the North Platte Valley of Nebraska, S. A. BROWN and R. O. SARGENT *(Natl. Child Labor Com. Pub. 318 (1924), pp. 106, figs. 20).*—This report is based upon facts obtained in a study of the children of contract labor families working in the sugar beet fields of Nebraska in 1923. The age, sex, and nationality of the children, kinds and amount of work done, the earnings, living conditions, and the effect of the work upon school attendance and school progress are set forth. The experiments made by the schools of Lincoln and Scottsbluff, Nebr., to reduce the amount of time lost from school by children employed in the beet fields are also discussed.

Child labor in representative tobacco-growing areas, H. A. BYRNE *(U. S. Dept. Labor, Children's Bur. Pub. 155 (1926), pp. V+42, pls. 2).*—This report gives the findings of an investigation made in 1923 in representative tobacco-growing sections in Kentucky, South Carolina, and Virginia, and in the Connecticut Valley. Environment, age, sex, and color of children employed; the kind of work done; the hours and earnings; and the effect of such employment upon school attendance and school work are described.

Agricultural statistics by counties and crop districts, 1922–24 *(Canada Bur. Statis., Agr. Statis., 1922–1924, pp. 38).*—This report presents the acreages and yields of field crops and the numbers of livestock by counties and crop districts for the several provinces for 1922 to 1924, with the exception of the field crops data for Quebec which embrace only 1922 and 1923.

Statistics of consumption of meat in Spain *(Estadística del Consumo de Carnes en España, Año 1925. Madrid: Asoc. Gen. Ganaderos, [1926?], pp. 59, pls. 8).*—Statistics are given of the number of animals slaughtered, meat produced, and consumption of meat per capita from January 1 to December 31, 1923, by provinces, together with comparative figures for other countries.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Agricultural occupations of the graduates of Pennsylvania colleges, J. C. HADLEY *(Jour. Rural Ed., 5 (1926), No. 7–8, pp. 344–346).*—This study is based on a questionnaire sent 35 universities and colleges in Pennsylvania and

other data obtained from the Pennsylvania State College and the University of Pennsylvania. Only 1.18 per cent of the graduates of nonagricultural institutions whose occupations were known were engaged in any type of agricultural work, as compared with 81.2 per cent of the graduates of the School of Agriculture of the Pennsylvania State College whose occupations were known. Of the other schools of the Pennsylvania State College, the percentages of graduates whose occupations were known and who were engaged in the lines for which trained were for engineering, 95 per cent; chemistry, other than agricultural chemistry, 86 per cent; and commerce and finance, less than 50 per cent (estimated).

In 1921, the Pennsylvania State College and vocational schools sent out 113 new farmers, or about 1.4 per cent of the actual number needed in the State each year.

Fundamentals involved in the organization and conduct of vocational agricultural schools and classes, C. V. Williams (*Thesis, Univ. Nebraska, Lincoln, 1925, pp. 130*).—This thesis, submitted as partial fulfillment for the degree of doctor of philosophy, has for its objective the interpretation of the character of progress made in vocational agricultural departments and schools and the directions in which the various phases of the work may best be developed. The subject is considered in eight chapters as follows: Preliminary considerations, character and length of the course of study for day schools, emphasis and character of farm shop, supervised practice and project activities, community and prevocational activities, vocational agriculture in other than the day school, improvement of teachers in service, and administrative and supervisory problems.

Agricultural education in England and Wales ([*Gt. Brit.*] *Min. Agr. and Fisheries, Leaflet 197 (1926), pp. 28*).—A short description is included of the instruction given in agricultural subjects in the universities, agricultural colleges, and special institutions, and in farmers' institutes, fixed dairy schools, and similar institutions of the two countries.

[**Methods of teaching poultry husbandry**], A. G. Philips (*Poultry Sci., 5 (1926), Spec. No., June, pp. 37–44*).—The answers to a questionnaire sent to colleges teaching poultry husbandry by the committee on poultry curricula and methods of teaching poultry husbandry of the American Association of Instructors and Investigators in Poultry Husbandry are compiled and discussed.

American economic life and the means of its improvement, R. G. Tugwell, T. Munro, and R. E. Stryker (*New York: Harcourt, Brace & Co., 1925, pp. XIV+633, figs. 285*).—This is a general elementary introductory textbook of economics, and was prepared for use in "An Introduction to Contemporary Civilization" course at Columbia College. This course is a five session a week interdepartmental course for freshmen contributed to by the departments of history, philosophy, government, and economics. Its purpose is to give a survey of the field of modern social problems and to supply an adequate background for its understanding, and in planning the course an effort has been made to think out the whole present situation of man, to pose the crucial problems he faces, to locate the germinal forces of the present, and to show the roots of these forces in the past. The discussion method is used in conducting the course, and this text is one used for a basis of such discussions. It covers the present levels of living, both rural and urban, and the possibilities and methods of raising such levels through increasing rural and urban productive efficiency, through just apportionment of income, through rational use of income, and through socio-economic planning for economic progress.

How to prepare and display extension exhibits, H. W. Gilbertson (*U. S. Dept. Agr., Dept. Circ. 385 (1926), pp. 29, figs. 14*).—This circular contains sug-

gestions for county extension agents, State specialists, and local leaders in planning, preparing, displaying, advertising, supervising, judging, and following up exhibits. Various types of exhibits and explanatory materials are discussed.

FOODS—HUMAN NUTRITION

Food, nutrition, and health, E. V. McCollum and N. Simmonds (*Baltimore: Authors, 1925, pp. VII+143*).—"This book is written to meet the need of the general public for a nontechnical account of the results of modern researches on foods and nutrition. The essential facts necessary to an understanding of what can and what can not be accomplished through diet are presented without the burden of the great mass of experimental data both on man and animals upon which present-day knowledge in this field is based."

Scientific nutrition in infancy and early childhood, S. McLean and H. L. Fales (*Philadelphia: Lea & Febiger, 1925, pp. XVI+17-404*).—This volume is essentially a handbook for general practitioners, nurses, and nutrition workers on the principles of feeding infants and young children, disturbances of the digestive tract, other conditions associated with disturbed nutrition, and calculation of dietary values. Data in regard to nutritional requirements, the composition of food materials used in feeding infants and young children, and other useful data are appended.

Nutritive value of the protein in voluntary muscle, heart, liver, and kidney from cattle, sheep, and hogs, R. Hoagland and G. G. Snider (*Jour. Agr. Research [U. S.], 32 (1926), No. 11, pp. 1025-1040, figs. 2*).—The flesh and certain organs of cattle, sheep, and hogs purchased in unfrozen condition on the local market were tested for the nutritive value of their proteins by the same methods as in a similar study previously noted (E. S. R., 54, p. 390). The materials were fed at protein levels of 10, 12½, and 15 per cent. The average results obtained are given in the accompanying table. The number of animals upon which these averages are based was 8 in the first series, from 4 to 8 in the second, and 4 in the third, both male and female rats being used for each test.

Nutritive value of protein in animal parts

Kind of tissue	Average gain in weight per gram protein fed					
	10 per cent protein		12.5 per cent protein		15 per cent protein	
	30 days	60 days	30 days	60 days	30 days	60 days
	Grams	*Grams*	*Grams*	*Grams*	*Grams*	*Grams*
Ox muscle	3.08	2.87	2.50	1.86	2.29	1.62
Hog muscle	2.79	2.24	2.57	1.89	2.27	1.62
Sheep muscle	2.94	2.21	2.27	1.63	2.06	1.66
Ox heart	3.10	2.44	2.64	2.06	2.30	1.75
Hog heart	2.91	2.28	2.95	2.18		
Ox liver	2.67	2.09	2.51	1.68	2.40	1.86
Hog liver	3.21	2.26	2.46	1.84	2.21	1.59
Sheep liver	3.00	2.36	2.62	1.87	2.07	1.40
Ox kidney	2.86	2.22	2.59	1.98		
Hog kidney	3.04	2.19	3.01	2.16		

The utilization of protein by the male rats was much more efficient in all cases than by the females. This is attributed to the more rapid growth of the male. The more efficient utilization of protein during the 30-day than the 60-day period, as shown by the table, is attributed to the increasing requirement for maintenance as compared with growth as the animal increases in weight.

"As regards the probable relative nutritive values of voluntary muscle, heart, liver, and kidney from the ox, sheep, and hog, as sources of protein in the human dietary, it seems likely that when the diet contains an adequate amount of protein these tissues will have approximately the same value for maintenance and growth."

The quality of Oklahoma flour, A. DAANE (*Oklahoma Sta. Circ. 63 (1926), pp. 7, figs. 2*).—Comparative baking tests conducted independently at Minneapolis, Minn., and at El Reno, Okla., are reported for several brands of flour milled in different parts of Oklahoma and for others from neighboring States. In both the larger series of samples tested at Minneapolis and the smaller at El Reno, the average score of the Oklahoma flours was higher in activity, absorption, and volume of the loaf than the flours from neighboring States. On chemical analysis, the Oklahoma flours compared favorably with the out-of-state flours. The ash content was slightly lower, the protein higher, and the color slightly better.

Modern views on vitamins, J. C. DRUMMOND (*Jour. Roy. Soc. Arts, 74 (1926), No. 3825, pp. 369–382*).—This survey of recent progress in vitamin research deals more particularly with the chemical aspects of the subject. Classifying the five now recognized vitamins according to their solubility, the author first discusses the available knowledge concerning the chemical nature of the three fat-soluble vitamins, A, D, and E, and their action in the animal body. His conception of the possible mechanism of the action of these vitamins in the animal body is as follows:

"Progress in physical chemistry in its application to biological problems is slowly being made in many fields. We are learning how a film of molecules, only a single molecule in thickness, may profoundly modify the properties of a living tissue. The formation of such a monomolecular film, as it is termed, of lactic acid seems to initiate the train of physicochemical changes that causes a muscle to contract; the displacement of the normal reactants at the surface of minute granules in the living cells by a monomolecular film of an anesthetic such as ether, or of certain poisons, brings about the inhibition of the cellular oxidations that we call narcosis. Interference with the structure of the molecular film of fatty substances at the surface of the blood corpuscles completely changes their permeability, and may lead to the escape of the cell contents, termed hemolysis, and virtual death of the cell. The extremely minute amounts of the fat-soluble vitamins which are physiologically efficient tempt one to speculate that in this direction may lay the explanation of their action. At any rate, some such line of approach seems likely to lead to an explanation of the curious changes in permeability to calcium and phosphates—the essential building stones of the bony structures—which is shown by the walls of the mammalian gut in response to changes in the amount of antirachitic vitamin administered."

The discussion of the water-soluble vitamins, B and C, is concerned chiefly with a correction of the earlier theories concerning the nature of the incoordination of the muscular system in avian polyneuritis. This is attributed to a depression of the oxidative activity of the tissues rather than to lesions of the peripheral nerves. This depression is thought to account for a number of the characteristic symptoms of the disease, as well as to afford an explanation of the quantitative relationship of vitamin B to the total amount of food catabolized by the body. The importance of providing an ample supply of vitamin B in the diet is strongly emphasized.

The effective dosages of vitamin concentrates reported in the literature have been reduced to a uniform basis for purposes of comparison and to illustrate the remarkable activity of the vitamins. The values are as follows:

Approximate minimal dosages of vitamin concentrates

Vitamin	Smallest recorded effective dose	Kind of animal	Weight of animal	Effective dose per 100 grams body weight
	Gram.		*Grams*	*Gram*
A	0.00001	Rat	100	0.00001
B	.00008	Pigeon	300	.000027
C	.00045	Guinea pig	300	.00015
D	.0001	Rat	100	.0001
E	.0005	Do	200	.00025

Blood counts in vitamin-A deficiency disease with especial reference to the platelets, E. H. Falconer and G. Peachey (*Amer. Jour. Physiol., 76 (1926), No. 1, pp. 145–150*).—"Twenty-four blood counts made on rats in various steps of vitamin A deficiency showed an average number of platelets 204,209 lower than our normal animals; an average number of red cells 137,500 higher than the controls; and an average number of white cells 2,338 higher than the normal control with an inversion of the polymorphonuclear-lymphocytic ratio. From these results we conclude that changes in the relative number of platelets, red cells, and white cells in the blood of rats are not striking enough, or constant enough, to constitute specific lesion of vitamin A deficiency in these animals."

The effect of vitamin A deficiency upon the character of nitrogen metabolism, A. F. Morgan and D. F. Osburn (*Jour. Biol. Chem., 66 (1925), No. 2, pp. 573–594*).—Data obtained in experiments conducted for 3-day periods on a small number of rats on diets supposedly adequate in all respects and a diet lacking only in vitamin A appear to indicate differences in the excretion of allantoin and uric acid in the normal and vitamin A-deficient animals. On the normal diet the relative amounts of allantoin decreased with gain in body weight and increased with loss in body weight. On the vitamin A-deficient diet there was an increase in the relative amounts of allantoin with a smaller loss in body weight and a decrease with increased loss in body weight. The excretion of uric acid varied inversely with that of allantoin.

"It is suggested that in the absence of vitamin A the animal organism fails to produce purine-containing compounds from the ordinary sources, perhaps arginine and histidine, but continues to utilize over again such portions of discarded purine ring-containing substances as are ordinarily excreted in the form of allantoin. The portions of these compounds which are oxidized only to uric acid are apparently no longer usable, and continue to be excreted in proportion to the amount of destruction of cellulur material in vitamin A-deficient as in normal animals."

A note on the blood-sugar levels of rats fed with complete diets and diets deficient in vitamin B, P. Eggleton and L. Gross (*Biochem. Jour., 19 (1925), No. 4, pp. 633–637, figs. 3*).—This contribution to the literature on the effect of lack of vitamin B on metabolism consists of determinations of the blood sugar of adult rats on complete diets and on diets deficient in vitamin B from 1 to 3 hours after feeding, 24 hours after feeding, after a glucose meal, and after a starch meal. Determinations were also made of the glycogen content of the livers of rats on both diets from 1 to 3 hours and 24 hours after feeding.

The average value of the blood sugar in normal rats after a 24-hour fast was found to be 0.09 per cent. This was not appreciably lowered by the simultaneous administration of adrenalin. Higher and more irregular values

were obtained with rats which had been kept on a vitamin B-deficient diet for 40 days, the average being 0.115 per cent. It is suggested that the higher values may be due to absorption from the atonic intestine (E. S. R., 51, p. 463). The lack of vitamin B resulted in no change in the rate of absorption of glucose but in a progressive decrease in the glycogen content of the liver. The food intake of the animals on the deficient diet averaged only 50 or 60 per cent of that of animals of the same weight on the complete diet, and this could not be increased by the addition of meat extract to improve the flavor of the food. This confirms the work of others in illustrating the stimulating effect of vitamin B on the appetite.

Note on the effect of high temperatures on the accessory food factor content of cod-liver oil, H. W. SOUTHGATE (*Biochem. Jour., 19 (1925), No. 5, pp. 733–736, fig. 1*).—To test the effect of heat alone on the stability of the fat-soluble vitamins in cod-liver oil, samples of unrefined oil were heated in such a way as to exclude all possibility of oxidation, the temperature being gradually raised to 200° C. in the first hour and kept at this point for the remaining time. Samples removed at the end of 1, 3, and 7 hours were tested for vitamin A and the antirachitic vitamin by feeding experiments with young rats and radiographic examination of the bones.

Growth curves are given for a family of 10 rats, pairs of which were tested with 0.1 gm. each of the various substances. Growth was normal on the unheated and the sample heated for 1 hour, somewhat below normal on the sample heated for 3 hours, and practically at a standstill on the sample heated for 7 hours. The calcification results paralleled those on growth.

In a test with varying amounts of the different samples, 5 mg. of the unheated sample proved sufficient to restore normal growth when this had ceased on the basal diet. About 40 mg. of the sample heated 1 hour and 180 of that heated 3 hours were required for the same amount of growth, and practically no growth was obtained with 0.3 gm. of the sample heated for 7 hours.

The author concludes that prolonged heating in the absence of air has a destructive effect upon both vitamin A and the antirachitic vitamin.

The preparation, physiological properties, and method of standardization of a parathyroid hormone, J. B. COLLIP and E. P. CLARK (*Roy. Soc. Canada, Proc. and Trans., 3. ser., 19 (1925), Sect. V, pp. 25, 26*).—A still more active preparation of the parathyroid hormone than the one previously described (E. S. R., 53, p. 563) has been secured by rendering the aqueous extract containing the active fraction acid to Congo red, precipitating the active fraction by adding sodium chloride to saturation, repeating the process, dissolving the precipitate in weak alkali, adjusting the pH to 4.8 (the isoelectric point), redissolving in dilute acid the precipitate which forms, and repeating the isoelectric precipitation several times. The precipitate is finally dissolved in dilute acid, pH 4, or obtained as a powder by suspending it in absolute alcohol, adding an equal volume of ether, washing the precipitate with dry ether, and drying it in vacuo over concentrated sulfuric acid and potassium hydroxide.

It is reported that normal dogs under suitable dietary regulations may be used to determine the potency of extracts, the increase in serum calcium obtained in a definite time being proportional to the dosage. The unit adopted is 1/100 of the amount required to produce a 5 mg. rise in blood serum calcium in 15 hours in a dog weighing 20 kg. One unit of the purest material thus far obtained weighs approximately 0.0004 gm. The material is said to contain 15.5 per cent of nitrogen, with traces of iron and sulfur but not phosphorus, and to give a negative Molisch reaction.

Goiter—a dietary problem, J. W. TURRENTINE (*Sci. Amer., 134 (1926), No. 4, pp. 248, 249, figs. 5*).—A general discussion of the relation of iodine to goiter,

with particular reference to the use as a prophylactic and therapeutic measure of a flour made from algae (E. S. R., 52, p. 366).

A biochemical study of bone growth, I–III, F. S. Hammett (*Jour. Biol. Chem., 64 (1925), Nos. 2, pp. 409–428, figs. 4; 3, pp. 685–696, figs. 3*).—In this investigation of the chemical differentiation of normal bone during growth, white rats were used as the experimental animals. The various phases of the investigation are reported in three papers as follows:

I. *Changes in the ash, organic matter, and water during growth (Mus norvegicus albinus)* (pp. 409–428).—In this study the following points were brought out: The percentage of ash in the humerus is higher than in the femur in both sexes at all ages and is higher in both bones of the female than of the male. The percentage of water in both bones of both sexes decreases with age. Two marked drops in growth capacity occur, the first at 30 days or shortly after weaning and the second at 65 days or at the onset of puberty.

II. *Changes in the calcium, magnesium, and phosphorus of bone during growth* (pp. 685–692).—Analyses for calcium, magnesium, and phosphorus of the humerus and femur of male and female rats during the growth period from 23 to 150 days of age are reported, with the following conclusions:

"Three significant relations have been brought out. The first is that the calcium percentage of the bones of the female albino rat is at all the observd ages greater than that of the male. The second is that in general the relations exhibited by calcium and phosphorus are the same as those which obtain for the ash and are similarly interpretable. The third is that the participation of magnesium, as an ash constituent, in the development of bone is different from that of calcium and phosphorus."

III. *Changes in the composition of the ash during growth* (pp. 693–696).—From the data obtained in the first two studies, calculations were made of the means and probable errors of the calcium, magnesium, and phosphorus content of the ash of the bones at the various ages. The calcium percentage of both bones of both sexes increased with age, the greater part of the increase taking place between 23 and 65 days, although in the female the stabilization was not complete until about 100 days. The percentage of phosphorus decreased during the same period, the greater part of the decrease being completed by the time the rats were 75 days old. The magnesium also decreased, the greater part of the decrease in the male taking place between 50 and 65 days and in the female between 65 and 75 days.

Nitrogen and sulfur metabolism in the dog, M. Fay and L. B. Mendel (*Amer. Jour. Physiol., 75 (1926), No. 2, pp. 308–329*).—In this reinvestigation of the ratio of nitrogen to sulfur in metabolism under varying conditions, 4 dogs in good nutritive condition were kept in metabolism cages and fed according to the plan outlined by Cowgill (E. S. R., 50, p. 367) with the use of a vitamin B concentrate to maintain the appetite. The diets used included nitrogen-free diets and complete diets with casein, meat residue, and egg white as sources of protein. Starvation periods after periods of adequate feeding and of nitrogen starvation were included, the length of the experiments varying from 9 to 38 days each. Determinations were made daily, or at 2- to 3-day intervals, of urinary and fecal nitrogen and urinary sulfur with calculations of the nitrogen balance and of the ratio of urinary nitrogen to sulfur.

In 1 dog during fasting periods of 16 and 9 days, respectively, values of 15.6 and 14.07 were obtained for the nitrogen-sulfur ratio. In a starvation period of 20 days following a period of nitrogen starvation, the nitrogen-sulfur ratio was high at first, reaching a value of 24.4 on the second day, and then decreased, giving an average of 17.63. In a 31-day period on nitrogen-free food following

starvation, a ratio of 14.04 was obtained and in a 19-day period for the same dog an average value of 10.7. Other values obtained on a nitrogen-free diet were 14.5, 14.3, 12.7, and 19.2.

On a casein diet for 37 and 38 days, respectively, the average ratio was 22 for 1 dog and 28 for another. On the same diet following complete and nitrogen starvation for a number of days, high ratios were obtained in the early periods, pointing to a definite retention of sulfur. In another experiment in which the animals had suffered large depletions of their body reserves there was a delay in the retention of sulfur. In the meat residue experiments, as in the casein, each animal had its own characteristic nitrogen-sulfur ratio, which was 30.2 for 1 dog and 22.1 for another. In the egg-white experiment alone the nitrogen-sulfur ratio showed close agreement with that of the food and remained at a fairly constant level throughout.

These findings are discussed at considerable length with reference to previous work on the subject, particularly that of Wilson (E. S. R., 53, p. 762) and of Lewis (E. S. R., 35, p. 863). In conclusion the authors state that "the fact that sulfur is retained by the body seems to be established. The great increase in value of the ratios during the earlier days of feeding an adequate diet after starvation can be interpreted in only one way—specific retention of sulfur. The idea that the sulfur fraction of the protein complex is more reactive in the building up and in the breaking down of tissue is an attractive one. Much of the evidence presented to substantiate the idea is based upon interpretation of results rather than upon clear-cut facts, which are difficult to obtain. Much more proof is needed before it can be stated that the breaking down of the protein complex is instituted through the sulfur-bearing fragments."

The distribution of phosphorus compounds in blood, R. V. Stanford and A. H. M. Wheatley (*Biochem. Jour., 19 (1925), No. 4, pp. 706–709*).—Analyses by the method noted on page 410 have been made of five samples of human blood for the distribution of phosphorus. The data obtained show that the relative quantities of inorganic, lipin, and unknown phosphorus in the blood are fairly constant, and that the unknown phosphorus is almost entirely in the corpuscles.

Hemochromatosis and chronic poisoning with copper, F. B. Mallory (*Arch. Int. Med., 37 (1926), No. 3, pp. 336–362, figs. 30*).—In this further discussion of the relation of chronic copper poisoning to pigment cirrhosis or hemochromatosis (E. S. R., 53, p. 276) the author describes briefly the various types of cirrhosis, discusses in considerable detail the gross and histological lesions of the pigment type, and presents evidence showing the relation of this type to copper poisoning. In conclusion, the danger in the use of copper in cooking and eating utensils is emphasized as follows:

"Copper is an exceedingly useful and indispensable metal in many ways, but it should not be employed where it may come in contact with foods or drinks, especially if they contan acids of any sort, because it is so readily dissolved by many of them. This would exclude its use for cooking utensils of any sort, for shakers of cocktails and acid drinks, and for the worms of the condensers in stills. Its use in pipes for drinking water and for hot water heaters is probably without danger."

TEXTILES AND CLOTHING

Some effects of humidity on the properties of fabrics, with special reference to the control of humidity during strength tests, R. G. Parker and D. N. Jackman (*Jour. Soc. Chem. Indus., 45 (1926), No. 9, pp. 47T–54T, figs. 7*).—The fabrics investigated under the auspices of the British Launderers'

Research Association included woven cotton, wool, and silk, mercerized cotton, linen, wool hosiery fabric and hosiery, silk knitted fabric, celanese rayon woven fabric, and celanese and viscose rayon hosiery fabric. All the fabrics stretched considerably, and excepting woolen hosiery fabric the extensibility was not greatly increased by wetting. Small amounts of water were retained by the fabrics, the residual moisture approximating 1 to 2 per cent in all except celanese, even after drying for 5 days over phosphorus pentoxide. The moisture content in general tended to rise with increasing rapidity as the humidity rose.

At 70 per cent relative humidity (the normal value) the fabric samples contained from 6 to 12.4 per cent of water, in the order celanese, cotton, linen, silk, wool, and viscose, and these positions were maintained at other atmospheric conditions tested. After the initial period of rapid water absorption the change rate became increasingly more gradual, but in general equilibrium was attained after 2 days' exposure to a given atmosphere.

Cotton and mercerized cotton increased slightly in bursting strength with rising humidity, and linen gained over 25 per cent in strength when wet. The other fabrics lost largely and fairly regularly in strength as the humidity increased, although silk lost only half as much as viscose and celanese and wool were intermediate between silk and viscose. In all cases the strength change caused by wetting appeared to take place very rapidly. Pieces tested immediately after wetting and other pieces soaked for 2 days did not differ in strength. However, all fabrics reverted to about their original strength when again conditioned at 70 per cent relative humidity.

The changes in strength seemed highly significant in relation to the resistance of the fabric to stresses received during wet cleaning processes. Since all the fabrics except cotton and linen show temporary losses of strength of from 26 to 66 per cent when wet, and the weight of the cloth may be increased three or four times by the water soaked up during the washing process, the weaker fabrics may be stretched or torn merely by lifting them with insufficient care during washing.

Wetting produced an immediate fall in strength, and prolonged soaking in cold water or cold soap solution caused no further decrease. One per cent sodium oleate solution at 60° caused a marked further decrease in the strength of silk and wool, but had no further effect on the rayon fabrics. The viscose fabric tested suffered a large loss of strength immediately on immersion in cold distilled water, but no treatment affected it further. The other fabrics lost more strength after boiling for 1 hour in water than after immersion in cold water. All the fabrics except wool lost the same in strength after boiling in 1 per cent sodium oleate solution as after boiling in water. Wool suffered a large decrease in strength, and even at 60° was weakened by treatment with 1 per cent sodium oleate. The wool, silk, and celanese were weakened more by boiling in 1 per cent solution of sodium oleate than by boiling in 1 per cent sodium carbonate.

The structure and formation of bast fibers in flax, D. B. Anderson (*Science, 64 (1926), No. 1646, pp. 64, 65*).—According to this contribution from the Ohio State University, flax bast fibers are formed by the periodic addition of definite lamellae of pure cellulose to the existing walls and not by a continuous and gradual acquisition of cellulose particles. The lamellae are deposited out of contact with the existing wall in a much infolded, gelatinous condition and are subsequently pushed to the walls. No cementing material is between the lamellae, which may readily be separated with proper treatment. The lamellae are composed of spirally wound crystalline fibrillae, and consecutive lamellae have spirals in opposite directions. This may be the result of the presence of isomeric forms of cellulose. These facts appear to have an impor-

tant bearing upon the elasticity, permeability, strength, durability, and adsorptive powers of such fibers.

Characteristics and uses of spun rayon, J. W. Cox, JR. (*Textile World, 69* (*1926*), *No. 24, pp. 63, 65, 67*).—The origin and methods of production of spun rayon and the characteristics of the fiber and yarns and fabrics made from it are described, with comment on its use in different fabrics. The present advantages include a great flexibility in fabric effect, enhanced appearance of textile materials, obtaining woolen and worsted feel or handle without using wool, and a cost less than that of thrown silk, spun silk, or good worsted yarns, although higher than coarse wool yarns. Among the disadvantages are lack of strength when wet, loss of strength after sizing or slashing, poor spinning qualities as compared to wool, fuzzy yarn, and tendency of fabrics to "dust" easily.

The properties of shoe leather, I–III (*Jour. Amer. Leather Chem. Assoc., 21* (*1926*), *Nos. 4, pp. 193–206, pls. 18; 5, pp. 241–250, figs. 7*).—These three papers are the first of a series in which it is planned to measure and list the more important properties of 18 varieties of shoe leather, including upper leather, lining, and sole leather, all of the samples for each kind of leather being taken from the same skin in the finished state ready to be manufactured into shoes.

I. *Micro-structure*, J. A. Wilson and G. Daub (pp. 193–198).—The method used in preparing the samples for microscopic analysis and in making the microphotographs is outlined, and descriptions are given of the samples, with reproductions of the microphotographs.

II. *Chemical composition*, J. A. Wilson and G. O. Lines (pp. 198–206).—Chemical analyses, with descriptions of the methods employed where these differed from the Official methods of the American Leather Chemists Association, are given of the 18 types of leather used for the microscopic study reported above.

III. *Ventilating properties*, J. A. Wilson and R. O. Guettler (pp. 241–250).—The 18 types of shoe leather used in the above studies were tested for ventilating properties by determining their porosity and permeability to water vapor at varying temperatures and relative humidities. The ventilating properties appeared to depend more upon the content of oil and finishing materials than upon the kind of tannage or skin. Buck and suede showed high ventilating properties owing to their loose open structures and to the absence of sizing materials ordinarily used in leather finishing. The low ventilating properties of patent leathers are attributed to the effect of collodion.

HOME MANAGEMENT AND EQUIPMENT

Adsorption of carbon dioxide by coal, E. Sinkinson and H. G. Turner (*Indus. and Engin. Chem., 18* (*1926*), *No. 6, pp. 602–605, fig. 1*).—Studies conducted at Lehigh University are reported which showed that the greater adsorptive power of anthracite over bituminous coals appears to lie in the character of the carbon present and in its quantity.

The lower activity of the charcoals from coals as compared with artificially prepared charcoals may be due to an infiltration of bituminous matter into the pores of the adsorbent. Inhibition also may be the result of condensation of oxidation products previously adsorbed in gaseous form. It was shown that with coal carbon dioxide will produce elevations of temperature above those obtained with oxygen under similar conditions. It is suggested, therefore, that carbon dioxide plays an important rôle in spontaneous combustion by producing an immediate rise in temperature through the adsorptive energy between the coal and the gas.

Effect of various carbon pigments upon rate of oxidation of linseed oil, F. H. RHODES and H. E. GOLDSMITH (*Indus. and Engin. Chem., 18 (1926), No. 6, pp. 566–570, figs. 8*).—Studies conducted at Cornell University are reported which showed that the addition of lampblack or carbon black to raw linseed oil very markedly inhibits the oxidation of the oil. This is not due to the presence of oily or oil-soluble impurities in the pigments but to the continuous adsorption of the intermediate oxidation product which acts as the true catalyst in the drying reaction.

The carbon pigments only slightly retard the oxidation of freshly prepared paints containing cobalt drier. The inhibiting effect becomes more pronounced as the paints are allowed to stand, due to the gradual adsorption of the cobalt drier by the pigment.

When added to linseed oil containing lead drier carbon black and lampblack were found to inhibit almost completely the oxidation of the oil during the first few hours of exposure. This is attributed to the fact that the pigments adsorbed not only a portion of the lead drier but also the small amount of autocatalytic oxidation product that is formed at the beginning of the oxidation.

Carbon pigments were found to have little effect upon the rate of oxidation of linseed oil containing manganese drier.

Furniture, floors, and finishes: Their identification, treatment, and care, S. H. BOOMER and K. W. WOODWARD (*N. H. Univ. [Agr.] Ext. Circ. 58 (1925), pp. 19, figs. 4*).—Practical information on the identification, finish, and care of the various kinds of wood used in furniture and interior finish is presented.

Safety rules for the installation and maintenance of electric utilization equipment (*U. S. Dept. Com., Bur. Standards Handb. 7 (1926), pp. V+71*).—This handbook contains safety rules for the installation and maintenance of electric utilization equipment and the grounding rules of the fourth edition of the National Electric Safety Code.

MISCELLANEOUS

Agricultural investigations at the United States Field Station, Sacaton, Ariz., 1922, 1923, and 1924, C. J. KING and A. R. LEDING (*U. S. Dept. Agr., Dept. Circ. 372 (1926), pp. 46, figs. 20*).—The experimental work reported is for the most part abstracted elsewhere in this issue.

Report of the Alaska Agricultural Experiment Stations, 1924, C. C. GEORGESON (*Alaska Stas. Rpt. 1924, pp. [2]+47, figs. 22*).—This contains the organization list and a report of the several lines of work carried on. Meteorological data and accounts of the extensive tests with field and garden crops and other experimental work are abstracted elsewhere in this issue.

Annual Report of [Louisiana Stations], 1925, W. R. DODSON ET AL. (*Louisiana Stas. Rpt. 1925, pp. 56, fig. 1*).—This contains the organization list, a financial statement for the fiscal year ended December 31, 1925, and a report by the director, including brief departmental reports and meteorological data. The experimental work reported is for the most part abstracted elsewhere in this issue.

Thirty-sixth Annual Report [of New Mexico Station, 1925], F. GARCIA (*New Mexico Sta. Rpt. 1925, pp. 62, figs. 2*).—This contains the organization list, a report of the director on the work and publications of the station, and a financial statement for the year ended June 30, 1925. The experimental work reported is for the most part abstracted elsewhere in this issue.

Bimonthly Bulletin of the Ohio Agricultural Experiment Station, [May–June, 1926] (*Ohio Sta. Bimo. Bul., 11 (1926), No. 3, pp. 89–128, figs. 19*).—This number contains several articles abstracted elsewhere in this issue.

NOTES

California University and Station.—Contracts have been signed for the immediate construction of an agricultural engineering building at the Davis Branch of the College of Agriculture. The total cost is to be approximately $140,000, of which $125,000 was specifically provided for at the last legislature.

Science notes that Joseph C. Chamberlin, assistant entomologist of the Citrus Substation, has accepted a teaching position in the department of biology of the San Jose State Teachers College.

Purdue University and Station.—The work in forestry has been transferred from the School of Science to the School of Agriculture and organized as a department of forestry headed by B. N. Prentice. It is planned to offer additional courses and eventually to institute experimental and extension work in forestry.

A new short course in agriculture of eight weeks' duration is being offered, opening October 25 and closing December 22. Students participating therein will have the opportunity of entering a second course of eight weeks beginning January 17, 1927.

Following a shrinkage each year for the past five years, the entering class in the School of Agriculture shows an increase of about 20 per cent.

The new horticultural building, costing approximately $150,000, is now completed and will be dedicated November 11. It is a four-story brick structure containing 45 rooms and about 25,000 sq. ft. of floor space. On the first three floors are classrooms, laboratories, and offices for the entire horticultural staff of the institution. Among the special features provided are a modern cold-storage plant with rooms available at different temperatures, a spraying machinery laboratory, a laboratory equipped for canning and preserving and the utilization of by-products, and various facilities for the work of the station.

A project dealing with seasonal changes in the composition of Stayman apple trees, which was undertaken a few months ago by Dr. H. R. Kraybill, has been transferred from the Boyce Thompson Institute of Plant Research to the station and will be continued under his leadership. L. P. Miller, associate biochemist, and J. T. Sullivan, assistant biochemist of the institute have been appointed assistant chemists and will carry on this work as a cooperative project of the two institutions.

L. H. Fairchild, associate professor of dairying and associate in milk production, resigned September 20 to engage in commercial work. Miss Miriam Rapp has been appointed research assistant in home economics to carry on Purnell projects, and Miss Gertrude Owen, clothing specialist in home economics extension work.

Nebraska University.—The enrollment in the entering class of the College of Agriculture is 181, as compared with 99 a year ago. Of this number 103 are men, an increase of 56. For the college as a whole an increase of at least 25 per cent is expected.

North Carolina College and Station.—A special experiment station committee, consisting of three members named by the college and three by the State Board of Agriculture, has been appointed to review the research work

in agriculture. This committee will have direct oversight of all experimentation on the six substation farms, with a view to determining its practical value to farmers of the State. A new joint committee to supervise work in which both the college and the State Department of Agriculture are concerned and known as the joint committee on agricultural work has also been appointed.

During the summer there was completed a new $250,000 building, which will house the animal husbandry and horticultural departments. The building has been named for Col. L. L. Polk, founder of the *Progressive Farmer* and one of the men who worked for the establishment of the present college. The building is a complete modern structure, fully equipped with laboratories for dairy and meat work.

In addition to the regular farm field days and picnics which are held on the substation farms each summer, a new plan of holding specialist meetings has been announced. This new series of meetings will consist of special days for dairy, horticulture, agronomy, etc., to which only those specialists and farmers interested in a particular line of work will be invited. Over 20,000 people visited these substations during the past summer, and it is expected that the new plan will further increase this number.

Pennsylvania College and Station.—C. R. Mason and G. F. Miles, assistant professors of vegetable gardening extension and plant pathology extension, resigned October 10 and September 1, respectively. New appointments effective September 1 include Emil Kant and Harrison M. Tietz as instructors in landscape gardening extension and zoology, respectively.

Vermont University.—The private library of the late Arthur E. Horton, a highway and park engineer of Lexington, Mass., and a native of Vermont, has been given to the university in accordance with his wish that some New England collegiate institution be selected. The library is a general collection of approximately 1,500 volumes, but contains much agricultural material published in the earlier part and middle of the last century.

Virginia Truck Station.—A sweet potato storage house of 1,000-bu. capacity has recently been added to the equipment of the station. This house will be used for certain phases of sweet potato storage investigations which are now being conducted in two 10,000-bbl. storage houses in Accomac County.

Wisconsin Station.—During the past year over 94,000 legume cultures were distributed by the department of agricultural bacteriology. There was a marked increase in the demand for alfalfa, sweet clover, and other clover cultures, which made up over half of the total output, but a decline in the sales of cultures for soy beans and peas. Dr. A. L. Whiting, associate professor of agricultural bacteriology, who has been employed in the manufacture and distribution of legume cultures and in research on the problems involved in this work, has resigned to resume the commercial preparation of cultures.

In the use of the tuberculin test there has always been the problem of the small number of animals which react positively but show no internal lesions of tuberculosis, although frequently having what are known as skin lesions. A study has been made by the departments of bacteriology and veterinary science in which certain acid-fast bacilli were found in such cases. It appears that few of these nonlesion reactors are commonly met with, but while the number is so small as not to be of great economic importance, efforts have been made to determine the nature of the organism. *Bacillus phlei*, which is supposedly found on timothy, has given positive results, and when hogs were treated with it they became sensitive to the tuberculin test. It is suggested that there may be other acid-fast bacilli which cause this phenomenon, and which may be

partly responsible for the three or four nonlesion reactors which are commonly found per 1,000 reactors.

A fellowship to study the action and utilization of citric acid and its salts in dairy production has been established by a firm of New York manufacturers of citric acid products. The work will be conducted under the direction of Dr. H. H. Sommer in the dairy department, and Dr. H. L. Templeton has been appointed to fill the fellowship. W. B. Sarles has been appointed to the industrial fellowship of the International Milk Dealers Association, which was established three years ago and which has been continued for the academic year 1926-27.

What is said to be the most complete file of Belgian bee journals in the Dutch language that has ever been assembled has recently been acquired by the Miller Memorial Bee Library, now reputed to be the largest collection of books and journals relating to apiculture in the world.

California Forest Experiment Station.—The location of this new station, authorized by Congress on March 3, 1925, as the ninth in the system of regional stations, has been decided upon as Berkeley. This will permit of close cooperation with the forest school of the University of California and also with the extension service.

Macdonald College.—Dr. F. C. Harrison has resigned as principal to devote his entire time to research and the training of graduate students. Dr. W. H. Brittain, professor of entomology at the Nova Scotia Agricultural College and provincial entomologist for Nova Scotia, has been appointed professor of entomology beginning September 1.

Peruvian Agricultural Institute of Parasitology.—This institute has recently been organized by the National Agricultural Society of Peru to study the insect pests and fungus diseases which affect the crops of the coastal region, especially cotton and sugar cane. Dr. C. H. T. Townsend has been appointed in charge of this institute and is engaged in the selection of a site and the erection of the necessary buildings. It is expected that one of the earliest studies will be made of the cane borer, said to be the only insect which seriously damages sugar cane in Peru.

Agricultural Education in Great Britain.—A new wing is being added to the building of the School of Agriculture of Cambridge University, replacing a range of army huts set up in 1919. The new wing contains a basement, three stories, and storage space in the attic, and measures 26 by 80 ft. The basement will contain three rooms, of which one is to be used for the nutrition calorimeters and another for metabolism experiments. On the first floor is a lecture room and other facilities for the work in estate management and on the second floor quarters for the farm economics staff and a library. The top floor will be devoted mainly to plant breeding, horticulture, and tropical agriculture. The building is expected to be completed by April, 1927.

Dr. William Somerville, Sibthorpian professor of rural economy at Oxford University, has retired and has been succeeded by J. A. S. Watson, professor of agriculture and rural economy of the University of Edinburgh.

Agricultural Research in British East Africa.—From a loan fund of £10,000,000 available for the development of the British East African colonies and dependencies, the use of £4,000 has been recommended by an allotment committee for the Amani Institute for Agricultural Research. It is expected that this institute, originally established in Tanganyika Territory under German auspices, will be developed as a center of scientific agricultural research for the region and also as a means of promoting tropical economic development.

Association of Official Agricultural Chemists.—The forty-second annual meeting of the association was held at Washington, D. C., October 18–21, 1926. In honor of the twentieth anniversary of the passage of the Federal food and drugs act, the Association of Dairy, Food, and Drug Officials and the Association of Feed Control Officials met at the same time, and a joint session of the three associations was held on October 20. The first speaker on the morning program of the joint session was W. G. Campbell, Director of Regulatory Work, U. S. Department of Agriculture, who touched briefly on the changing problems connected with regulatory work resulting from the development of new methods of food manufacture, storage, etc. In his opinion facts rather than interpretation had made the more progress in the decade under review, while emphasis is now being placed on the economic features of regulatory work as illustrated by the work of the Grain Futures and Packers and Stockyards Administrations of the Department.

The presidential addresses of the three associations and a brief word of welcome from Secretary of Agriculture W. M. Jardine, completed the morning program. W. W. Randall of the Association of Official Agricultural Chemists spoke on The Rôle of Chemistry in Food and Drug Administration, T. Holt of the Association of Dairy, Food, and Drug Officials on The Part the States Have Played in the Pure Food Movement, and F. D. Fuller of the Association of Feed Control Officials on Twenty Years of Feed Control. Each of the speakers reviewed the more important achievements of the association which he represented and emphasized the importance and value of cooperation between the various associations.

The afternoon program was opened with a paper by C. A. Browne, chief of the Bureau of Chemistry, on The Relation of Research to Control, in which he gave a historical survey of the development of research with reference to control, noting the important contributions of various scientists and pointing out that, while separation of research from regulatory activities with the development of specialization is inevitable, there can be no fundamental regulatory acts without fundamental research. Mrs. Walter McNabb Miller, chairman of the Department of Public Welfare of the General Federation of Women's Clubs, discussed the part taken by the federation in securing the passage of the food and drugs act and in interpreting its standards to the women of the country. An exhaustive historical survey by C. W. Dunn of the various acts for the control of foods and drugs passed in England and this country up to the present time, and the customary informal talk by H. W. Wiley, honorary president of the Association of Official Agricultural Chemists, completed the program of the joint session.

The official work of the association was conducted as usual, with reports by the various referees, contributed papers, and committee reports. Appropriate resolutions were adopted by the association in memory of R. E. Doolittle, prominently identified with its work for many years and a former chairman of the committee on editing methods of analysis and of the committee on bibliography.

The officers elected for the coming year are as follows: President, W. H. McIntyre; vice president, O. Schreiner; secretary-treasurer, W. W. Skinner; and additional members of the executive committee, E. M. Bailey and L. D. Haigh.

First Congress of the International Association of Soil Science.—This congress, which will bring together for the first time in this country those interested in problems of soil classification, soil analysis, fertilization and treatment, and relation of soils to plant growth, will convene in Washington, D. C.,

on June 13, 1927. Its organization includes international commissions on soil physics; chemistry; bacteriology; fertility; nomenclature, classification, and cartography (with a subcommission on the preparation of the cartography of Europe); and the application of soil science to land cultivation. The American representatives of these commissions are, respectively, Drs. R. O. E. Davis, M. M. McCool, and S. A. Waksman, D. R. Hoagland, and Drs. C. F. Marbut and S. H. McCrory. Each of these commissions is arranging a program of from five to eight sessions, and additional sessions will be provided for the congress as a whole and for numerous joint meetings. The congress will be followed by a field excursion to various important soil belts in the country, as well as to numerous agricultural industries, experiment stations, and other points of interest.

New Journal.—*The Agricultural Journal of Egypt* is being published as an annual reprint in English of selected articles from the monthly Arabic edition. The initial number contains the following articles: Egyptian Soils and Their Supply of Organic Matter, by E. McKenzie-Taylor; Chicken Rearing in Egypt and Notes on a Small Experimental Test under Home Conditions, by J. D. Shepherd; An Outbreak of Glanders with Peculiar Features, by H. Mason; Opium Poppy in Egypt, by Sadik Eff. Rafael; Tree Planting on Agricultural Roads, by J. D. Shepherd; Sugar Cane (*Saccharum officinarum*), by Sadik Eff. Rafael; Note on the Importance of Using Good Cotton Seed (Taqawi) and a General Method of Obtaining Such Seed, by T. E. Bayne-Jardine; Ramie Rhea, or China Grass, by Sadik Eff. Ibrahim; The Cultivation of Flax at El Zaraby Village in Upper Egypt, by Farid Eff. Garas; Onions (Bassal), by Abdel Rahman Eff. Sirry; and the Bacterial Disease of Wheat Caused by *Pseudomonas tritici* (Hutchinson), by Tewfik Eff. Fahmy and Tewfik Eff. Mikhail.

Sborník Československé Akademie Zemědělské is being issued quarterly by the Czechoslovak Academy of Agriculture. The initial number consists of the following articles: Studies on the Mechanics of Anaerobic Respiration of Plant Organs, by J. Stoklasa and J. Bareš (with French and German summaries); The Microscopy of Cheese, by O. Laxa (with French summary); Schematic Plan for the Climatic Zone Soil Types in Czechoslovakia, by V. Novák (with German summary); Utility and Heredity Record Control in the Dairy Cattle of Moravia and Its Results, by J. Taufer (with English summary); and Observations in Explanation of the Physiological Variation in Moist, Air-Dried, and Otherwise Dried Soils, by V. Káš (with German summary).

The University of Missouri Studies is a quarterly of research, the chief function of which is announced as "to publish the results of original research by members of the faculty and graduate students," as well as "papers of exceptional merit from sources other than the faculty and graduate student body." The publication is intended for "extensive papers not included under the general and divisional bulletins." The initial number contains two papers, The Isoelectric Point for Plant Tissue and Its Importance in Absorption and Toxicity, by W. J. Robbins, and Parasitic and Wood-Destroying Fungi of Boone County, Missouri, by W. E. Maneval.

Insecta Matsumurana is being issued by the Entomological Museum, Hokkaido Imperial University, primarily for the description of new species of insects collected by Dr. S. Matsumura, numbering at least 100, and for description of other new insects named abroad. The journal is to be printed mainly in English or German, but will accept articles in French, and may include Japanese summaries.

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EXPERIMENT STATION RECORD

VOL. 55 OCTOBER ABSTRACT NUMBER No. 6

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Chemistry in agriculture, edited by J. S. CHAMBERLAIN and C. A. BROWNE (*New York: Chem. Found., 1926, pp. XI+384, pls. 40, figs. 6*).—This volume, which constitutes an attempt to explain in simple language the contributions of chemistry to various phases of agriculture, is largely the work of chemists at the agricultural experiment stations and the U. S. Department of Agriculture. The subjects and authors are as follows: Crops and the Soil, by R. W. Thatcher; The World's Food Factory, or the Plant in Air and Light, by J. M. Arthur and H. W. Popp; Soil Life, by J. G. Lipman; Where the Nitrogen Comes from, by H. A. Curtis; Maintaining Soil Fertility, by G. S. Fraps; Cereals, by C. H. Bailey; Sugar and Sugar Crops, by C. A. Browne; Fruits and Vegetables, by E. M. Chace; Fermentations on the Farm, by J. J. Willaman and R. A. Gortner; Chemical Warfare to Save the Crops, by A. J. Patten; Agriculture and the Evolution of Our Diet, by C. F. Langworthy; Vitamins in Human and Animal Nutrition, by R. A. Dutcher; Meat—Its Relation to Human Nutrition and Agriculture, by C. R. Moulton; Chemistry as a Guide in Animal Production, by E. B. Forbes and M. Kriss; The Chemistry of Milk and Its Products, by L. L. Van Slyke; and The Chemist as Detective and Policeman, or "Fertilizer, Feed, and Insecticide Control," by B. B. Ross.

The examination of substances important in agriculture and the agricultural industries.—II, The examination of substances important in agricultural industries, J. KÖNIG (*Die Untersuchung Landwirtschaftlich und Landwirtschaftlich-Gewerblich Wichtiger Stoffe.—II, Die Untersuchung Landwirtschaftlich-Gewerblich Wichtiger Stoffe. Berlin: Paul Parey, 1926, 5. ed., rev., vol. 2, pp. XVI+971, figs. 98*).—This volume completes the revision of this reference book (E. S. R., 50, p. 311). The industries considered include sugar, alcohol, beer, wine, vinegar, charcoal, potato drying and starch, milk and dairy products, edible fats and oils, lubricating, illuminating, and fuel oils, and fungicides and insecticides.

An introduction to industrial chemistry, S. I. LEVY (*New York and London: McGraw-Hill Book Co., 1926, pp. XIII+288, pls. 17, figs. 20*).—This volume, which has an introduction by W. J. Pope, differs from the majority of textbooks on industrial chemistry in that in place of dealing with the specialized technique of the various branches of the industry the author has developed the foundations which are fundamental to all chemical industries and has illustrated the principles thus developed by a few selected industries, including the fuel, sulfuric acid, alkali, and intermediates and explosives industries.

Chemistry and recent progress in medicine, J. Stieglitz (*Baltimore: Williams & Wilkins Co., 1926, pp. VIII+62*).—In three lectures delivered at the Johns Hopkins University School of Medicine in 1924, the contributions of chemistry to recent progress in medicine are discussed along two general lines—the preparation of materials having to do with the cure and prevention of disease and the development of knowledge concerning physico-chemical reactions within the body. Under the first are discussed important advances in the preparation and study of specific drugs foreign to the normal chemistry of the body, the isolation and use of the active principles of normal secretion of the glands of the body itself, and the isolation of active principles such as antitoxins produced in the body by reactions with foreign bodies. In the second are included a discussion of phosphorus and calcium metabolism in the body, the complex equilibria of the blood with its cell contents, and the oxidation reduction reactions in the body.

Recent advances in physical and inorganic chemistry, A. W. Stewart (*London and New York: Longmans, Green & Co., 1926, 5. ed. pp. XI+312, pls. 6, figs. 29*).—In the revision of this volume, an earlier edition of which was noted (E. S. R., 40, p. 801), 12 new chapters have been written dealing with various subjects which have developed since the writing of the previous edition. Of particular value to those who have not the time to follow in detail the newer developments in theoretical chemistry are the first and final chapters dealing, respectively, with the changes which have taken place during the last quarter of a century in several fundamental ideas of chemistry and with the chronological development of present views concerning the nature of the atom.

Introduction to the chemistry of polymeric carbohydrates, P. Karrer (*Einführung in die Chemie der Polymeren Kohlenhydrate. Leipzig: Akad. Verlagsgesell., 1925, pp. IX+285, fig. 1*).—This monograph deals with the chemistry of starches, glycogen, reserve cellulose or lichenin, cellulose, inulin, and chitin as discussed in recent literature, references to which are given as footnotes.

Pectin bodies, R. Sucharipa (*Die Pektinstoffe. Brunswick: Serger & Hempel, 1925, pp. 188, figs. 9*).—In this monograph the author, who has himself conducted extensive investigations on the subject (E. S. R., 51, pp. 209, 310), reviews the original literature on pectin from the standpoint of constitution, manufacture, uses, detection, and determination, and gives an extensive list of references.

The utilization of pentoses by yeasts and the composition of plant gums, O. D. Abbott (*Missouri Sta. Research Bul. 85 (1926), pp. 3–29, fig. 1*).—The chief purpose of the investigation reported in this publication was to test the accuracy of the yeast fermentation method of determining pentosans by studying the utilization of pentoses by different yeasts under varying environmental conditions.

Twelve yeasts and related organisms were used in fermentation tests in 0.1 per cent arabinose solution in a suitable nutrition medium. Of these, 6 were unable to utilize the arabinose in 20 days at pH 6, while the other 6 destroyed it completely under the same conditions. Fleischmann's yeast was able to utilize xylose and arabinose at pH 5 to 6.6 in from 48 hours to 5 days, depending upon the amount of yeast and carbohydrate present. The reaction of the medium and the quantity of inoculum were found to affect the fermentation reactions of pure and mixed yeasts. The products of fermentation consisted chiefly of nonvolatile acids, with traces of carbon dioxide and alcohol and in some cases a reducing substance thought to be glyceric or glycolic aldehyde. It is concluded that the fermentation method as commonly used is inaccurate for the determination of pentoses. Two possible modifications of the method

are suggested, first, by controlling the reaction of the medium and second, by using pure cultures of yeast known to ferment hexoses but not pentoses.

An attempt to determine the chemical composition of orange gum is also reported. On elementary analysis the empirical formula $C_{32}H_{44}O_{28}$ was obtained. The gum gave positive phloroglucin and mucic acid tests. On hydrolysis for 3 hours with 1 per cent hydrochloric acid, carbon dioxide equivalent to 6.5 per cent of the dry weight of the gum was given off, indicating some decomposition of the gum. The gum was completely hydrolyzed by taka-diastase, with the evolution of no carbon dioxide. Fermentation of the hydrolyzed gum with Fleischmann's yeast resulted in a further reduction in reducing value.

New facts concerning the fat-soluble vitamins, J. C. DRUMMOND (*Lancet [London], 1926, I, No. 6, pp. 272, 273*).—A brief summary of recent progress in the study of the fat-soluble vitamins A, D, and E, particularly as regards attempts to isolate these vitamins and determine their chemical nature.

The effect of fermentation with specific microorganisms on the vitamin C content of orange and tomato juice, S. LEPKOVSKY, E. B. HART, E. G. HASTINGS, and W. C. FRAZIER (*Jour. Biol. Chem., 66 (1925), No. 1, pp. 49–56, figs. 3*).—To determine whether the cause of the destruction of vitamin C in corn and cabbage in the manufacture of silage and sauerkraut, respectively, is the action of microorganisms, canned tomato juice was pipetted under aseptic conditions into sterile test tubes, inoculated with the organisms to be tested, neutralized with calcium carbonate if too acid for the particular organism, and immediately covered with a vaseline plug. The use of the vaseline plug had previously been found satisfactory to prevent the destruction of vitamin C by the oxygen of the air, a destruction shown by experiments to take place readily in tubes protected only by cotton stoppers. The microorganisms tested included *Streptococcus lactis*, an organism isolated from sheep manure by Fred, Peterson, and Davenport (E. S. R., 41, p. 614) and known to occur in silage, and a proteolytic organism isolated from cheese. The treated tomato juice was allowed to ferment at room temperature and was kept for 24 days before feeding to guinea pigs in 4-cc. amounts.

With *S. lactis* there appeared to be no destruction of the vitamin in 7 days and partial destruction after 28 days. No evidence of destruction of the vitamin was obtained with the other two organisms. It is concluded that "there is no logical reason why microorganisms should not be found that will destroy vitamin C, but it is altogether probable that its disappearance from fermented corn (silage) and fermented cabbage (sauerkraut) is to be referred to a destruction through contact with oxygen, which is low in amount but seldom completely absent in the gases taken from the silage mass. This is especially true unless the silage is taken far from the surface or periphery of the silo. So far as we are aware the gases in a mass of fermented cabbage have not been investigated."

Correlation of test weight per bushel of hard spring wheat with flour yield and other factors of quality, C. E. MANGELS and T. SANDERSON (*Cereal Chem., 2 (1925), No. 6, pp. 365–369*).—In the correlation studies reported from the North Dakota Experiment Station, data from seven crops of hard red spring wheat from the crop years of 1916 and of 1919–1924, inclusive, were used to determine correlation between test weight per bushel and yield of flour, color score of bread, loaf volume, and absorption, respectively.

A high positive correlation was found between test weight and flour yield, a positive correlation with varying coefficients for the different crops between test weight and color, and no significant correlation between test weight and loaf volume and between test weight and water absorption. The test weight per bushel is considered to be a valuable factor.

Effect of fine grinding upon flour, C. L. Alsberg and E. P. Griffing (*Cereal Chem., 2 (1925), No. 6, pp. 325–344*).—Studies are reported on the effect of overgrinding flour upon the amount and composition of the cold water extract, the rate of diastatic conversion of the starch, the quantity and quality of the gluten that can be washed from the flour, and the baking strength of the flour. The flours used were ground to pass through standard bolting cloth of 150, 166, 173, and 178 mesh. In each case the samples contained the whole of the patent flour reduced to the stated fineness and not successive portions of the flour separated according to fineness.

The cold water extract was found to increase, the percentages of ash and nitrogen in the extract to decrease, and substances reducing alkaline copper solution after acid hydrolysis to increase with overgrinding. This would appear to indicate that the increase in water extract is due chiefly to starch. The diastatic activity of the overground flour was much higher than of ordinary flour, again indicating a change in the starch through the breaking up of the granules. The loss of carbon dioxide early in fermentation as measured by the method of Bailey and Johnson (E. S. R., 53, p. 410) was more rapid than for corresponding normal flour.

Moderate overgrinding appeared to increase and severe overgrinding to decrease the absorption powers of the gluten. From the most severely overground samples no gluten could be washed. Baking tests corroborated the chemical tests as indicating that severe overgrinding is detrimental to the flour.

Cacao, cacao powders, and powdered food mixtures with and without cacao, R. Lecoq (*Cacao, Poudres de Cacao et Farines Composées Alimentaires avec et sans Cacao. Paris: Vigot Bros., 1926, pp. 180, figs. 100*).—This is a monograph on the cacao, including its culture, commercial varieties, the physical and chemical properties of the cacao seed, processes involved in the making of chocolate and cocoa, formulas for the preparation of food products containing cocoa, and chemical and microscopical analyses of cacao products.

Humidity equilibria of milk powders, G. C. Supplee (*Jour. Dairy Sci., 9 (1926), No. 1, pp. 50–61, figs. 4*).—Moisture-humidity hydration and dehydration equilibrium tables and curves are reported for six different brands of milk powder, each representing a different method of manufacture, and for five samples of Just process milk powder, with fat content varying from 1 to 53 per cent. The relative humidities ranged from 10 to 80 per cent at 25° C. and the moisture content from 1 to nearly 15 per cent.

The hydration curves all showed a characteristic break at approximately the same level for all powders of the same protein content irrespective of the method of manufacture, but at different levels for powders of varying protein content. The break or period of greatest instability occurred at humidities between 40 and 50 per cent. Above this point the initial absorption was very rapid, but between 50 and 70 per cent the moisture was not retained by the powder.

The dehydration curves obtained after the samples had been kept at a humidity of 80 per cent for 3 weeks and then returned to the respective humidities at which they had been dehydrated were smooth typical absorption curves.

Hydration and dehydration curves are also reported for samples of the same skim milk powder previously subjected to varying heat treatments and moisture saturation. The same general type of curves was obtained but with lower equilibrium levels.

Sweetened condensed milk.—III, In a total solids residue what is the form of lactose? F. E. Rice and J. Miscall (*Jour. Dairy Sci., 9 (1926), No. 1, pp. 62–64*).—This study is a continuation of a series previously noted (E. S. R., 52, p. 314).

To determine whether the lactose present in the dry matter of milk is in the hydrous or anhydrous form, two experiments were carried out. In one an aqueous solution of pure lactose was evaporated as in the total solids determination for condensed milk. In the other a known amount of lactose was added to a solution of condensed milk and the total solids determination was then conducted in the usual manner. The weights of the residues obtained in both cases indicated the lactose to be in the anhydrous form.

A study of the determination of the neutralizing value of monocalcium phosphate, H. ADLER and G. E. BARBER (*Cereal Chem., 2 (1925), No. 6, pp. 380–390*).—The methods at present available for determining the neutralizing value of monocalcium phosphate are discussed from the point of view of their value in calculating the proportions of phosphate and bicarbonate to be used in baking. H-ion concentration determinations are ruled out as not taking into consideration the nature of the reacting substances. As the most satisfactory method, an indirect titration method is recommended which, if followed exactly, is considered to be of practical value. The technique is as follows:

"Weigh out 0.84 gm. of the phosphate and place in a casserole. Add 25 cc. of cold water and after stirring for a moment add exactly 90 cc. N/10 sodium hydroxide. Bring the solution to boil in 2 minutes and boil for 1 minute. While the solution is still boiling hot add 0.05 cc. of 0.25 per cent phenolphthalein solution and then N/5 hydrochloric acid until the pink color of the indicator has all but disappeared. Boil the solution then for 1 minute and again add at once standard hydrochloric acid until the pink color has just disappeared. Multiply the total number of cubic centimeters of standard acid used by 2 and subtract from 90. The difference is the baking value of 100 parts of the phosphate in terms of bicarbonate of soda."

Some observations on making ash determinations, D. A. COLEMAN and A. CHRISTIE (*Cereal Chem., 2 (1925), No. 6, pp. 391–397*).—Data are presented on the effect of certain variables on ash determinations in flour.

In imperfectly ventilated electric muffles certain spots were found where combustion was incomplete. In a study of the effect of varying temperatures, the most uniform results were obtained by heating the sample for 16 hours at a temperature of 585° C. Fusion was found to lead to irregular results. The Hertwig-Bailey method of ashing with a mixture of alcohol and glycerol (E. S. R., 53, p. 807) was found to give an ash of good quality. Using this method, it was found that a 2-gm. sample requires 3 hours for complete ashing and a 3-gm. sample an additional hour. If the ashing is continued for 16 hours, identical results are obtained with 2-, 3-, 4-, and 5-gm. samples.

The use of the quinhydrone electrode for measuring the hydrogen-ion concentration of soils, L. D. BAVER (*Soil Sci., 21 (1926), No. 3, pp. 167–179, figs. 2*).—This contribution from the Ohio Experiment Station consists of the report of a study of various factors entering into the use of the quinhydrone electrode for measuring the reaction of soils. The various points studied included the use of saturated, normal, and tenth normal calomel cells, the effect of varying the amounts of quinhydrone, the constancy of potential, a comparison of the use of quinhydrone and hydrogen electrodes in determining the H-ion concentration of typical soils, and a study of the effect of the soil-water ratio on H-ion concentration as determined with the quinhydrone electrode.

The saturated calomel cell was found to be the most satisfactory, as it gave the most constant values and did not require a reversal of poles below pH 7.68, as was the case with the normal and tenth normal cells. The weight of quinhydrone necessary to give a constant voltage was 0.02 gm. for acid soils

and 0.05 gm. for alkaline. No change resulted on adding the quinhydrone in excess of 0.05 gm. For convenience, the use of a freshly prepared solution of the quinhydrone in place of the solid material is recommended. Except in cases of alkaline soils of a pH value above 8 there was no significant deviation in potential during a 10-minute period. In a sample of alkaline soil the deviation was about 0.1 pH in 3 minutes and 0.33 in 10 minutes. By making the readings immediately good checks between duplicate samples are considered possible even with alkaline soils.

A comparison of the quinhydrone and hydrogen electrodes on 12 different soils showed variations from 0 to 0.2 pH. A soil-water ratio of 1:1 was found most satisfactory to use as a standard with the quinhydrone electrode. To eliminate calculations in the conversion of voltage to pH values, a table is given of the equivalent pH values for voltages of from −0.0485 to +0.1023.

The author concludes as the result of this work that "the quinhydrone method has a very distinct advantage over the ordinary hydrogen electrode inasmuch as the apparatus required is simpler, both in construction and operation, and requires a much shorter time to reach equilibrium. The method is applicable to field as well as laboratory purposes."

The salt error of indicators caused by standard alkaline buffers themselves, J. W. McBain, O. E. Dubois, and K. G. Hay (*Jour. Gen. Physiol., 9 (1926), No. 4, pp. 451–465, figs. 3*).—Attention is called to discrepancies observed between the true alkalinity or pH value of solutions of pure sodium hydroxide and of many standard alkaline buffer solutions giving the same actual color. These discrepancies are shown to be due to the salt error caused by the buffer itself. Of 30 indicators tested, all but 3 (alizarin yellow G, tropeolin O, and thymol violet) showed appreciable errors, in the most extreme case exceeding 2 pH units. Several of the indicators showed a maximum depth of color after a sufficient amount of indicator had been added but a disappearance of the color on further addition of the indicator.

Standard methods of analysis of fertilizers, edited by J. Sen (*Agr. Research Inst., Pusa, Bul. 164 (1926), pp. III+14*).—The methods described are based on the 1920 Official Methods modified to meet local conditions in India.

Improved method for making cider vinegar, S. C. Vandecaveye (*Washington Col. Sta. Bul. 202 (1926), pp. 5–26*).—An investigation undertaken to discover the reasons for frequent failures in securing proper vinegar fermentation under average farm conditions is reported, with definite recommendations which, if followed, are thought to insure the production of vinegar of uniformly excellent quality.

Two series of experiments were run, one including 500-cc. quantities of cider placed in bottles in triplicate and the other 4-gal. quantities in 5-gal. kegs in duplicate. The small scale tests were largely for the purpose of determining the rapidity of alcoholic fermentation at from 65 to 75° F. in untreated cider and in cider treated with a pure culture of *Saccharomyces ellipsoideus* in the amount usually recommended and in double that amount. At the end of the alcoholic fermentation some of the bottles were inoculated with pure cultures of vinegar bacteria, *Acetobacter aceti*, in the proportion recommended to vinegar makers, and the course of acetic fermentation was compared with that in the uninoculated samples. In the larger scale experiments the comparison was made of both the alcoholic and acetic fermentations at from 65 to 75°, the optimum for yeast and acetic organisms, and at from 45 to 55°, the temperature prevailing in unheated farm cellars. Jonathan, Wagener, and Rome Beauty varieties were used singly and combined and washed and unwashed.

At temperatures of 65 to 75°, vinegar of marketable strength was obtained in many cases in less than 4 months and at the lower temperatures in less

than 1 year. Inoculation with pure cultures of both yeast and vinegar bacteria hastened the fermentation processes, particularly at the lower temperature. Under ordinary conditions of temperature and aeration, the acetic fermentation did not progress to any marked extent until the completion of the alcoholic fermentation. For this reason it is considered best to postpone the inoculation with pure cultures of vinegar bacteria until the alcoholic fermentation is complete.

It was found unnecessary to remove the sediment after the alcoholic fermentation before the acetic fermentation. It is recommended that the cider be left in the original container until the completion of both fermentations, after which the clear vinegar should be transferred immediately to clean containers and bottles. It is emphasized that the barrels and all utensils used for vinegar making should be thoroughly scalded with steam or boiling water and rinsed with plenty of clean water and that the apples be sorted and washed before pressing.

Of the three varieties of apples used, the Jonathan gave the best results, but mixed ciders from the three varieties also proved satisfactory.

The dehydration of prunes, A. W. Christie (*California Sta. Bul. 404 (1926), pp. 3–47, figs. 12*).—This bulletin is chiefly concerned with the construction and operation of dehydraters for prunes, superseding Bulletins 330 and 337 (E. S. R., 45, p. 808; 46, p. 509) in this regard. The various steps in the dehydration of prunes are summarized as follows:

"Lye dip as soon after harvesting as possible and rinse in fresh water. Separate into two or more size grades when traying. Enter in cooler end of dehydrater, preferably of air-blast type, at 120 to 140° F. Finish at a temperature not exceeding 165° and a humidity not exceeding 25 per cent. Store the thoroughly dried prunes in bins for at least two weeks before delivery to packing house, turning if examination reveals inadequate equalization."

Industries for the conservation of fruits, C. Arnou (*Les Industries de la Conservation des Fruits. Paris: Libr. Spéciale Agricole, 1925, pp. 280, figs. 104*).—This volume includes in addition to sections on red fruits and stone fruits, previously noted (E. S. R., 45, p. 665), a section on miscellaneous fruits, in which methods are given for preserving pineapples, anjelica, almonds, walnuts, bananas, chestnuts, figs, guava, oranges, lemons, citron, mandarins, raisins, rhubarb, and tomatoes.

Perfumes, cosmetics, and soaps, with especial reference to synthetics, I, II, W. A. Poucher (*New York: D. Van Nostrand Co., 1926, 2. ed., vols. 1, pp. IX+304, [pls. 22], fig. [1]; 2, pp. XVI+406, [pls. 42], figs. [4]*).—With the enlargement of the subject matter of the volume previously noted (E. S. R., 50, p. 308) the present edition is issued in two volumes, the first of which deals with the raw materials of perfumes, cosmetics, and soaps and the second with the preparation of natural and artificial perfumes and the manufacture of modern cosmetics.

METEOROLOGY

A new proof of the variability of the sun, based on Mount Wilson observations, C. G. Abbot (*U. S. Mo. Weather Rev., 54 (1926), No. 5, pp. 191–194, fig. 1; abs. in Sci. Amer., 135 (1926), No. 3, p. 211, fig. 1*).—A comparison of pyrheliometric measurements of solar radiation made in July, 1910 and 1920, on days when the atmospheric conditions were practically identical show a close correlation with sun spots, both as to short interval and long interval variations.

Monthly Weather Review, [May–June, 1926] (*U. S. Mo. Weather Rev., 54 (1926), Nos. 5, pp. 191–235, pls. 10, figs. 38; 6, pp. 237–280, pls. 6, figs. 3*).—In addition to detailed summaries of meteorological and climatological data and weather conditions for May and June, 1926, and bibliographical information, notes, abstracts, and reviews, these numbers contain the following contributions:

No. 5.—A New Proof of the Variability of the Sun, Based on Mount Wilson Observations (illus.), by C. G. Abbot (see p. 507); and A Summary of Aerological Observations Made in Well-Pronounced Highs and Lows (illus.), by L. T. Samuels.

No. 6.—On the Solution of Problems of Atmospheric Motion by Means of Model Experiments, by C. G. Rossby; Observing Water-Surface Temperatures at Sea, by C. F. Brooks; Recent Investigations on the Energy in the Earth's Atmosphere, Its Transformation and Dissipation, by E. W. Woolard; Conference of the International Commission on Solar Radiation at Davos August 31 to September 2, 1925, by H. H. Kimball; and Alaska's Mild Winter of 1925–26 (illus.), by H. J. Thompson.

[Climate maps of North Dakota], H. L. Walster (*North Dakota Sta. Bul. 194 (1926), pp. 5–9, figs. 6*).—Maps prepared from Weather Bureau data are given, which show average length of frost-free season, average mean temperatures for June, July, and August, and the rainfall distribution in the State.

Meteorological observations, 1924, H. M. Tydeman (*East Malling [Kent] Research Sta. Ann. Rpt. 1924, pp. 207–209, fig. 1*).—Observations on pressure, temperature, rainfall, sunshine, humidity, and wind at the East Malling Research Station are tabulated, and sunshine and rainfall are charted. The rainfall of the year was excessive, being 30.92 in., or 6.7 in. above the normal, and sunshine was deficient. The temperature was about normal.

The climate of the olive in Italy [trans. title], M. Briccoli (*Nuovi Ann. Agr. [Italy], 5 (1925), No. 3–4, pp. 333–372, figs. 3*).—This is an account of an ecological study dealing with (1) periodical phenomena in the life of the olive and at different stages of the growth period, (2) correlation of growth with meteorological conditions to determine optimum conditions of growth, and (3) correlation of temperature and precipitation and physiographic conditions with olive culture. The effect of deficiency or excess of rainfall and temperature at different periods of growth is dealt with in some detail.

The climate of Helwan, L. J. Sutton (*Egypt Min. Pub. Works, Phys. Dept. Paper 20 (1926), pp. [4]+82, pls. 17*).—Observations on pressure, temperature, humidity, cloud and sunshine, wind, precipitation, and evaporation at Heluan Observatory, which is situated about 25 km. south of Cairo on the western desert slope of the hills which border the Nile Valley on its eastern side, are summarized in tables and charts and briefly discussed, with a bibliography relating to the meteorology of Egypt and the Sudan.

Rainfall in the Netherlands Indies, I, II [trans. title], J. Boerema (*K. Magnet. en Met. Observ. Batavia, Verhandel, 14 (1925), pts. 1, pp. VIII+192; 2, pp. [2], pl. 1, maps 14*).—Tables and maps are given showing the mean yearly and monthly rainfall of Java and Madura (Madoera), based on observations at 2,715 rainfall stations during the period 1879–1922. The average annual rainfall for the period was 2.12 meters (83.46 in.).

SOILS—FERTILIZERS

Fertility and crop production, S. F. Hinkle (*Sandusky, Ohio: Author, 1925, pp. XII+338, pls. 41, fig. 1*).—The purpose of this handbook is to summarize the important findings of investigators at the experiment stations on the art and

science of soil fertility. It contains chapters on theories regarding fertility, building for high production, crop yields and profits, fertilizing crop and soil, systems of farming, drainage of farm land, irrigation, liming the land, rates of liming crops, utilizing manure, reinforcing manure, composting manure, legumes, comparative value of legumes for soil improving, comparative yield of legumes, rotation effect of crops on others, green manures and crop residues, organic matter, tillage, frequency and depth of cultivation, depth of application of commercial fertilizers, fertilizer materials, nitrogen fertilizer carriers, comparison of phosphate carriers, carriers of potassium, complete fertility, and sulfur and salt as fertilizers.

[Soil studies at the Iowa Station] (*Iowa Sta. Rpt. 1925, pp. 16–20*).—Tests of gypsum on Iowa soils during the past 4 years on 6 soil types in 10 counties have indicated that certain crop yields, notably alfalfa, may be increased considerably by gypsum when applied to certain soils. Other crops may not be benefited, and crops on other soils may not respond to the treatment.

Data secured on 42 of the cooperative soil experiment fields located on 16 of the more extensive soil types in the State have shown the average value of manure applied to a 4-year rotation to amount to $2.10 per ton.

Data on methods of applying fertilizers, management of Iowa soils, on the value of fertilizing materials, and on general soil experiments are also briefly summarized.

The mechanical classification of soils [trans. title], Z. STARZYŃSKI (*Pam. Państ. Inst. Nauk. Gosp. Wiejsk. Pulawach* (*Mém. Inst. Natl. Polon. Écon. Rurale Pulawy*), *3* (*1922*), *A*, *pp. 1–34*).—The author proposes a mechanical classification of soils on the basis of their content of particles smaller than 0.002 mm. and applies it to certain Polish soils. Thirty groups of soil particles are recognized by this procedure. He also proposes the name micropelite for particles smaller than 0.002 mm., and characterizes soils by the formula

$$\text{percentage of micropelite}\ \frac{\text{percentage of silt}-\text{percentage of sand}}{\text{percentage of clay}}$$

Methods of mechanical analysis of soils, D. J. HISSINK (*Internatl. Rev. Sci. and Pract. Agr.* [*Rome*], *n. ser., 3* (*1925*), *No. 3, pp. 705–724*).—In a contribution from the Groningen Experiment Station, Netherlands, attention is drawn to the great differences in the results of mechanical analyses of soils from different sources. It is concluded that such differences are due mainly to the methods of preparation followed. An attempt is made to describe and justify those methods of preparation which were finally adopted after a number of analyses were conducted in the laboratory. Observations in regard to new sedimentation methods are also included.

A new soil core sampler, E. B. POWELL (*Soil Sci., 21* (*1926*), *No. 1, pp. 53–57, figs. 3*).—A new soil core sampler employed at the Missouri Experiment Station is described and illustrated.

A movable lysimeter for soil studies, F. L. DULEY (*Soil Sci., 20* (*1925*), *No. 6, pp. 465–471, figs. 5*).—A movable lysimeter for soil studies developed at the Missouri Experiment Station is described and illustrated.

The control of soil moisture, P. H. CARPENTER (*Indian Tea Assoc., Sci. Dept. Quart. Jour., 1924, No. 3, pp. 168–177, pls. 2*).—Data are presented on the soil moisture conditions in northeast India, together with information on methods for its control.

Permeability of soil and subsoil for water as a main factor in productivity [trans. title], A. G. DOĬARENKO (DOJARENKO) (*Nauch. Agron. Zhur.* (*Jour. Landw. Wiss.*), *1* (*1924*), *No. 4, pp. 259–268, figs. 4*).—Studies are reported which showed the dependence of permeability of subsoils for water on their structure and the relation of such permeability to their productivity. The best

crop yields were obtained on soils having sandy strata in the subsoil, and the poorest yields were obtained on soils having impervious clay subsoils.

Soil reaction and plant distribution in the Sylene National Park, Norway, E. CHRISTOPHERSEN (*Conn. Acad. Arts and Sci. Trans., 27 (1925), pp. 471–577, figs. 22*).—Studies on soil acidity in relation to plant distribution made in the Sylene National Park, a high mountain area in southeastern Norway, are reported.

The soils of the area were found to vary in reaction from approximately pH 3.6 to pH 7.1. Each plant association of the area is limited in its distribution to soils within a definite and relatively narrow range of reaction, which is characteristic for each association. Soils of high acidity, supporting a definite association, may keep constant within a limit of 0.1 pH unit or less. Soils near the neutral point, supporting a definite association, may exhibit variations amounting to 1 pH unit or more.

Remains of eutrafentous vegetation, found as horizons in bog profiles, have not preserved their low H-ion concentration, but are of the same high acidity as the bog. A pan in the podsol profile is correlated with an increase in the H-ion concentration of the raw humus in which most of the vegetation is rooted. The composition of the parent rocks influences the H-ion concentration of the soils, granites and amphibolites producing soils of high acidity, while schists produce soils near the neutral point.

Pot cultures showed that pulverized lepidomelane (potassium mica) causes a considerable decrease in the H-ion concentration of natural humus soil and sand.

Alkali studies.—IV, Tolerance of oats for alkali in Idaho soil, R. E. NEIDIG and H. P. MAGNUSON (*Soil Sci., 20 (1925), No. 6, pp. 425–441, figs. 4*).—In a fourth contribution to the subject from the Idaho Experiment Station (E. S. R., 55, p. 117), studies are reported in which four crops of oats were grown in the greenhouse on Idaho soil treated with various concentrations and combinations of sodium carbonate, sodium chloride, and sodium sulfate.

The toxicities of the salt applications varied with the successive crops. In general, regardless of the type of treatment, the salt additions were the most toxic to the first crop. The majority of the salt treatments showed a stimulated yield of oats in the second crop, which was not maintained in the third crop. The fourth crop yields, where the salt concentration was not too high, showed a tendency of the soil to produce crops approaching normal.

Sodium carbonate additions above 0.4 per cent were toxic to oats. The toxic concentration of sodium chloride was between 0.2 and 0.3 per cent. Sodium sulfate in concentrations as high as 1.5 per cent did not appear to be toxic to oats except in the first crop.

Low additions of sodium chloride and sodium sulfate to a basic treatment of from 0.2 to 0.4 per cent of sodium carbonate usually showed increased yields over the basic single sodium carbonate additions. These results are taken to support, in a measure, the phenomenon of antagonism of anions.

Oats tolerated rather high concentrations of the combined alkali salts when the total salt content consisted of a low concentration of each salt.

Base exchange in relation to alkali soils, W. P. KELLEY and S. M. BROWN (*Soil Sci., 20 (1925), No. 6, pp. 477–495*).—Studies conducted at the California Experiment Station on the chemical reactions which take place between alkali salts and soils are reported, with particular reference to the development of practical methods for the reclamation of alkali soils.

Some residual effects of neutral salt treatments on the soil reaction, C. H. SPURWAY and R. H. AUSTIN (*Soil Sci., 21 (1926), No. 1, pp. 71–74, fig. 1*).—Studies conducted at the Michigan Experiment Station are reported, in

which soil samples from the horizons of four soil profiles were treated separately with the neutral salts calcium chloride, magnesium chloride, potassium chloride, and sodium chloride in order to determine the residual effect on the soil reaction after the soluble products of the soil-salt reaction were washed from the soils.

The calcium chloride treatment caused only slight changes in the soil reaction, whereas the magnesium chloride, potassium chloride, and sodium chloride increased the pH values. The effective order of the several cations was calcium, magnesium, potassium, and sodium.

The increased solubility and hydrolysis of the soil material containing the fixed cation are believed to be the cause of the increased pH values where the increases were noted.

The relationship between soluble iron and colloids in certain residual clays, G. R. MacCarthy (*Soil Sci., 20 (1925), No. 6, pp. 473–475*).—Studies conducted at the University of North Carolina are reported which appeared to show that the soluble iron in a completely weathered clay or soil is in the colloidal condition, whereas in less completely weathered material there are larger amounts of noncolloidal iron. These results are used to indicate a method of estimating the degree of weathering without resorting to a mineralogical examination of the material. The progress results of further experiments along this line are said to suggest that the deviation of the colloid percentages as obtained by the iron ratios from one and one-tenth times the percentages as obtained by water adsorption gives a rough approximation of the reciprocal of the weathering factor. This indicates that the greater the deviation the less is the weathering.

Decomposition of organic matter in soil, H. H. Hill (*Jour. Agr. Research [U. S.], 33 (1926), No. 1, pp. 77–99, figs. 2*).—Studies conducted at the Virginia Experiment Station are reported which showed that pure cellulose applied to soils in different amounts restricted plant growth. This restriction was proportional to the amount of cellulose added. The addition of potassium nitrate in quantities of about 0.01 per cent failed to offset this harmful effect. Varying the quantity of nitrate had very little effect in counteracting the ill effects of the cellulose beyond an 8-ton application.

Plants grown in a well-balanced nutrient solution were healthy and vigorous, but the addition of cellulose depressed growth. Conditions were improved slightly by renewing the nutrient medium frequently. The depression in plant growth was proportional to the amount of cellulose added. Decomposing cellulose produced hydrogen sulfide as a reduction product of the sulfates of calcium and magnesium contained in the nutrient solution. The root systems of the plants were altered materially by a cellulose treatment, the roots becoming very much discolored and altogether unhealthy in appearance.

Crimson clover when added to sand and to Hagerstown silt loam soil in tubs and allowed to remain out of doors gave increased plant growth. With four leading Virginia soil types, in tubs out of doors, rye in a green state depressed plant growth in the heavy clay types of soil. In the more open types of soil, a slight increase in growth was noted. Corn grown in the field where clover was turned under gave an increased yield over corn with the clover removed for hay. Corn was depressed in yield where rye was turned under over a period of 12 years.

Wheat grown where soy beans were cut for hay gave a much smaller yield than wheat which had soy beans turned under as a green manure. Wheat yields were slightly increased by the turning under of buckwheat, but there was a depression of yield when the buckwheat was removed for hay. Rye,

oats, clover, and vetch showed a varied ratio between their nitrogen and carbon contents when cut on May 17. The ratio between the nitrogen and carbon was much wider for the nonlegumes than for the legumes.

The evolution of carbon dioxide from rye, oats, clover, and vetch, cut on May 17 and mixed with soil, was much greater than from the same materials which had been allowed to air-dry for the same period of time. The legumes showed a more rapid decomposition in every case than did the nonlegumes. When green materials were allowed to decompose in the soil, no nitrates were detected after the experiment had been run for 10 days. With the same substances that had been allowed to air-dry, nitrates were present but in much greater quantity under a legume than under a nonlegume treatment.

Drying green manures retarded their decomposition when gauged by carbon dioxide liberation over a 10-day period. This retardation in decomposition may probably be dne to the soluble hemicelluloses and other polysaccharides having been changed to less soluble forms. Rye, oats, clover, and vetch, cut at different stages of development, showed wide differences in their nitrogen-carbon ratio. The younger the cutting the narrower was the ratio. The ratio between these two elements widened as the plant approached maturity. Vetch gave a much narrower ratio than any of the other crops studied.

Carbon dioxide liberation from green manures cut at different stages of growth showed a rapidity of decomposition in the order, vetch, clover, oats, and rye. Green manure cut between May 14 and May 28 showed the highest rate of decomposition. With cellulose in a pure form the decomposition was very slow. There was a fairly good nitrification with legume treatments, but with nonlegumes the nitrates formed were in much smaller amount.

The significance of nitrogen in soil organic matter relationships, F. J. Sievers and H. F. Holtz (*Washington Col. Sta. Bul. 206 (1926), pp. 5-43*).—The results of an analytical study are reported, the purpose of which is to establish the fundamental relationships that function in soil organic matter changes.

The results are taken to indicate that all soils are deficient in nitrogen in their primary stages of formation, and that this element can accumulate only as a result of legume fixation, free fixation, and precipitation. Both nitrogen and carbon exist in the soil very largely as part of the organic matter, and as such are always present in a comparatively definite ratio which is so stable that both nitrogen and carbon contents are used as a basis for calculating soil organic matter.

It has been found that in the process of decomposition of plant residues in the soil there is a tendency for the nitrogen-carbon ratio to be narrowed until it approaches that of the microorganisms responsible for the decomposition. This is the most pronounced where optimum conditions are provided for the decomposition of soil organic matter and where little or no provision is made to return plant residues.

It is stated that the differences in the distribution of organic matter in soil and subsoil in humid as compared to arid conditions can be explained on the basis of soil reaction. The rate of decomposition of soil organic matter is in proportion to the nitrogen content of the soil, and a high soil nitrogen content is also associated with a wide nitrogen-carbon ratio.

It is concluded that the influence of soil moisture on crop yield should be interpreted on the basis of its direct effect on the processes that provide available plant nutrients and not on the plant itself. The beneficial effects on the physical condition of the soil and on productivity resulting from

the incorporation of organic matter have been found to be in direct proportion to the nitrogen content.

The nitrogen content of organic materials to be returned to the soil may be increased either by decreasing the carbon, as in composting, or by increasing the nitrogen by the addition of a nitrogen fertilizer. The nitrogen content may be regulated by supplementing a residue with material high in carbon such as straw.

Transformation of nitrogen compounds in soil in connection with nitrification [trans. title], A. KUDRIAVTSEVA (KUDRIAWZEVA) (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 1 (1924), No. 4, pp. 297–311, figs. 4*).—Studies of the nitrogen forms in different soils are reported which revealed fixed differences in the character of the forms of nitrogen occurring in podsol and chernozem soils. Those in the latter soil were more stable in character, less easily leached out, and tended to accumulate in difficultly hydrolyzable forms. The nitrogen forms in the podsol were, on the contrary, more mobile, more easily hydrolyzed, and more soluble in acids.

Studies of the dynamics of the nitrogen forms in soils showed that the forms soluble in acids showed the same activity under aerobic and anaerobic conditions and in the presence and absence of nitrates. Under aerobic conditions in the absence of nitrates, nitrate formation occurred mainly at the expense of acid soluble forms of nitrogen. Under anaerobic conditions in the presence of nitrates, the nitrates frequently changed directly into acid soluble forms of nitrogen. This process was quite complicated, however, and nitrogen forms other than the acid soluble were also frequently formed. The main tendency under aerobic conditions was for stable nitrogen forms to change gradually into unstable forms with the reverse occurring under anaerobic conditions.

It is therefore considered incorrect to speak of nitrate disappearances from soils as nitrogen losses.

A study of microbiological activities in some Louisiana soils: A preliminary survey, E. V. ABBOTT (*Louisiana Stas. Bul. 194 (1926), pp. 3–25, fig. 1*).—Studies of the fungus flora of three alluvial soils cropped to sugar cane and one loessial soil cropped to cotton are reported.

It was found that the genera Aspergillus and Penicillium constitute 50 per cent of the total flora. Ninety per cent of all the fungi isolated belonged to the genera Aspergillus, Penicillium, Spicaria, Trichoderma, Fusarium, Mucor, Rhizopus, and Zygorhynchus. Members of 28 other genera were isolated. Marasmius and Rhizoctonia were isolated only infrequently.

The total numbers of microorganisms were nearly twice as great in the cane soils as in the cotton soils. Sour clover sown on plant cane and plowed under in the spring caused an increase in bacterial numbers which was evident throughout the year. The numbers of fungi and Actinomycetes did not seem to be materially affected by this treatment.

The sugar cane soils were found to have a greater nitrifying capacity than the cotton soil, as measured by the nitrification of dried blood and ammonium sulfate. Plowing Melilotus into the soil caused an initial increase in nitrate accumulation, but apparently did not affect the nitrifying power of the soil. An application of 3 tons of ground oyster shells per acre to the cotton soil caused an increase in the nitrifying power. The nonsymbiotic nitrogen fixing power of the sugar cane soils was approximately twice as great as that of the cotton soil. Azotobacter were plentiful in the cane soils but were almost lacking in the cotton soil.

Analysis of temperature conditions for the bacterial processes of soil in connection with the adaptability of bacteria to climate [trans. title], E. MISHUSTIN (*Pochvovedenie (Pédologie), n. ser., 20 (1925), No. 1-2, pp. 43-67*).—Studies of an entire series of pure cultures of bacteria of a physiological group from different soil types are reported.

The results showed the adaptability of northern microflora to an increased development at lower temperatures in comparison with southern microflora. On the other hand, they showed the adaptability of the latter microflora to existence at higher temperatures. The optimum temperature for soil bacteria of the northern type was found to be from 26 to 35° C. (78.8 to 95° F.), with a maximum of from 40 to 43°. For the southern soil bacteria the optimum temperature for development was from 33 to 37°, with a maximum of 55°.

Soil bacteria are divided on the basis of temperature conditions into psychophyles and mezophyles. The latter group is especially prevalent in soils. Denitrifying bacteria are classed in a so-called thermophyle group having a maximum development temperature of 76°.

A comparison of the development temperatures of crops of different climates with those of soil bacteria showed a rather close relation.

The effect of some antiseptics on soil amoebae in partially sterilized soils, L. B. SEWERTZOFF (*Centbl. Bakt. [etc.], 2. Abt., 65 (1925), No. 14-21, pp. 278-291, figs. 3*).—Studies are reported which showed that if the sterilizing antiseptic used is easily soluble in water a smaller dose of it is required to kill amebas and bacteria in solution than in soil. Such large amounts of antiseptics were necessary to destroy amebas in soil as to make their use impracticable for the partial sterilization of arable soils, especially where it is desired to destroy all protozoa.

Carbon disulfide did not kill the cysts of amebas in soil even when applied at the rate of 60 per cent by weight. Ether at the rate of 15 per cent and chloroform at the rate of 6 per cent both failed to destroy the cysts of amebas in the soils studied. Calcium oxide did not kill them even when added at the rate of 25 per cent by weight. Chlorine, which destroyed cysts of amebas in solutions at the rate of 60 parts per thousand, did not kill them in soil even when applied at the rate of 300 parts per thousand. The minimum toluol concentration capable of killing amebas in soil was 15 per cent, while calcium sulfide in a 5 per cent concentration did not kill either the cysts of amebas or the spores of bacteria in soil. A 1.5 per cent solution of calcium sulfide failed to kill even the nonspore-forming bacteria.

It was found that the spores of soil bacteria are more resistant to the antiseptics enumerated than the cysts of amebas. Nonspore-forming bacteria were destroyed in soil in all cases by smaller quantities of antiseptics than were the cysts of amebas.

[**Humus and soil fertility investigations at the Iowa Station**] (*Iowa Sta. Rpt. 1925, pp. 61, 62*).—A study of the relationship between soil reaction, total nitrogen, and the accumulation of ammonia and nitrates in soils showed that under unfavorable weather conditions ammonia may accumulate in soils, but that in most cases it is never higher than 0.002 per cent.

Crops having a more acid sap grow better on an acid soil than those with a less acid sap. Studies of the secondary effects of hill application of fertilizers (E. S. R., 54, p. 18) have indicated that ammoniates increase the carbon dioxide production more than other fertilizers. Ammonium sulfate was found to nitrify quite slowly in acid soil. Acid phosphate had more effect on soil acidity than potassium or ammonium salts.

Studies of the effect of straw applied alone and in combination with other nitrogenous materials on the accumulation of nitrates in soils and on crop growth showed that straw when applied with clovers, ammonium sulfate, or sodium nitrate does not retard plant growth.

Brown earth in Finland, B. AARNIO (*Internatl. Rev. Sci. and Pract. Agr. [Rome], n. ser., 3 (1925), No. 2, pp. 402–408*).—Chemical and physical analyses of the so-called brown earth soils as they occur in Finland are presented and discussed. These formations occur only in certain places and form flats of small extent. The formations in Finland differ from those in Germany, for instance, in the absence of concretions of calcium carbonate. They differ from the podsols by the absence of light-colored earth and the fact that their humus matter is less soluble in water. A low sesquioxide content and a slight difference as regards bedrock are common to these two soil types.

Profiles of peat lands within limits of extinct glacial lakes Agassiz and Wisconsin, A. P. DACHNOWSKI (*Bot. Gaz., 80 (1925), No. 4, pp. 345–366, figs. 3*).—In a contribution from the U. S. Department of Agriculture, these peat profiles are outlined and discussed in an attempt to show the connection between profile sections of peat lands and the environmental conditions which determine the formation of peat deposits.

The conclusion is drawn that it is the climatic aspect of peat profiles which should be emphasized in matters relating to the agricultural uses of lake bed peat lands. It is considered evident that the present native surface vegetation is no indicator either of the depth of peat accumulation, the sequence of layers, the character of the mineral subsoils, or the production possibilities for different systems of cropping. The profile sections indicate, furthermore, that production in these peat areas may depend chiefly on the quantity of water available.

"During the period before settlement, the arable land resources of the States had become filled with ground water from a long accumulation of rainfall and thaw waters. Since the settlement of the States, the ground water level has been steadily sinking. A serious situation may arise, therefore, in periods of drought, and settlers in that region may not be able to endure the years of adversity, if an extensive system of drainage is adopted without reference to the stratigraphic features of the peat lands.

"The provision of an adequate water supply and the control of water levels is essential if the agriculture of the region is to be permanent and satisfactory. The lack of a commensurate water supply may operate entirely against increasing production by intensive methods of farming. Such portions of the forested peat land area which contain deep, water-logged depressions are important water storage basins. They would help to regulate and maintain a favorable ground water table. It seems far more profitable, therefore, to select such localities and not to drain them but to keep them as part of a State reserve of reforestation."

Suggestions for cropping peat soils, G. R. MCDOLE (*Idaho Sta. Circ. 38 (1926), pp. 4*).—Practical information on the subject is briefly given.

Determination of the nutrient contents or of the fertilizer requirements of soils by the Neubauer process [trans. title], ENGELS and W. HIRSCHBERGER (*Landw. Jahrb., 60 (1924), No. 3, pp. 379–392*).—The results of pot, cylinder, and field tests of the Neubauer process of determining the fertility content and requirement of soil on the basis of the assimilation of soil nutrients by sprouts are reported. The results indicate a fairly close relation to those secured by the process.

Replacement of farm manure by commercial fertilizers, J. P. JONES (*Amer. Fert., 64 (1926), No. 1, pp. 23–25*).—Studies conducted at the Massachusetts Experiment Station are reported which showed that attempts to supply

through other means the organic matter furnished by stable manure by mixing in commercial fertilizers have not been promising for the tobacco crop.

Chemical fertilizers [trans. title], H. M. NAGANT (*Min. Agr. Prov. Québec Bul. 88 (1925), pp. 52, figs. 11*).—A large amount of information on the manufacture, selection, purchase, and use of chemical fertilizers is summarized in this publication. A section is devoted to home mixing of fertilizers on the farm.

Nitrogenous manures, P. H. CARPENTER and H. R. COOPER (*Indian Tea Assoc., Sci. Dept. Quart. Jour., 1924, No. 3, pp. 178–192*).—Data are reported which indicate that the nitrogenous fertilizer is the most important item of the fertilizer program for tea growing. Ammonium sulfate at present prices is said to offer the best value as a nitrogenous fertilizer for most soils. Milled fish manure is said to offer the best value as an organic fertilizer, especially for cases where phosphoric acid is also needed. Where nitrogen only is required oil cake provides the cheapest unit of nitrogen.

The availability of nitrogen in garbage tankage and in urea in comparison with standard materials, A. L. PRINCE and H. W. WINSOR (*Soil Sci., 21 (1926), No. 1, pp. 59–69, figs. 2*).—Studies conducted at the New Jersey Experiment Stations on the relative availability of garbage tankage and urea in comparison with other organic and inorganic nitrogenous fertilizers and on the rate of decomposition of urea under various conditions are reported.

The fertilizing value of garbage tankage was found to be very low. Most of its nitrogen content was very slowly available, and its total percentage of nitrogen was also low in comparison with that of other forms of organic nitrogen. It is thought that as a fertilizing material its chief value will probably be in its use as a filler.

Urea was found to be a very desirable source of nitrogen, and was very nearly equal to sodium nitrate in availability. In some cases it produced crop yields even greater than those produced with sodium nitrate, and in all cases it gave better results than ammonium sulfate.

Studies of the rate of decomposition of urea showed that after 5 days only 3 per cent was converted into ammonia in sand culture, 67 per cent in half sand cultures, and 90 per cent in pure soil. Over 50 per cent was converted into ammonia within 3 days in the soil. The rate of decomposition was very much retarded in an acid soil, and even at the end of 11 days only about 50 per cent of the nitrogen was converted into ammonia.

The application of various amounts of limestone to the acid soil proportionately increased the rapidity of urea decomposition.

The utilization of our phosphate resources, W. H. VOSKUIL (*Econ. Geogr., 1 (1925), No. 3, pp. 387–395, figs. 6*).—In a contribution from the University of Pennsylvania the different sources of phosphate in the United States are briefly discussed, attention being drawn especially to the losses through wasteful methods of mining rock phosphate and in the handling of barnyard manure and sewage.

Effects of lime and potash fertilizers on certain muck soils, W. F. LOEHWING (*Bot. Gaz., 80 (1925), No. 4, pp. 390–409, figs. 7*).—Studies conducted at the University of Iowa are reported which showed that crops on acid muck soils chemically deficient in lime or potash may be injured by these elements in fertilizers. Clover was found to be injured frequently by potassium. Calcium carbonate depressed the potassium content and the potassium-calcium ratio in crops grown on acid mucks.

Injuries following applications of lime and potash were marked internally by a depression of organic nitrogen and carbohydrate contents. An antagonism of ions between lime and potash was not observed. A high content of

nitrates in crop tissues was associated with a high calcium content and low crop yield. A high crop yield was associated with high contents of organic nitrogen and total carbohydrates.

Soil acidity and liming, R. HARCOURT, S. WATERMAN, and G. N. RUHNKE (*Ontario Dept. Agr. Bul. 313 (1925), pp. 32, figs. 25*).—Practical information on soil acidity and its correction by liming is presented.

[Liming experiments at the Mississippi Station], C. F. BRISCOE (*Mississippi Sta. Rpt. 1924, pp. 21–23, figs. 2*).—The results of experiments on the effect of adding lime with and without the turning under of green manure are briefly reported and illustrated .

Calcium sulfate as a soil amendment, M. H. CUBBON (*New York Cornell Sta. Mem. 97 (1926), pp. 3–51*).—Studies of the effect of calcium sulfate on the growth of various plants, on certain bacterial activities, and on chemical and physical changes in various soils are reported.

Calcium sulfate had no effect on the growth of pasture grasses, on the growth of chard plants in the greenhouse, or on the yield of cucumbers in the field. The percentage of total nitrogen in the chard plants growing on treated soil was significantly less than in plants on untreated soil.

Nitrate accumulation was retarded by the addition of calcium sulfate in practically all of the soils tested, especially in an alkaline silt loam soil. Calcium sulfate also depressed nitrate accumulation rather markedly in a clay soil maintained at low moisture contents. No depression occurred when the soil was exposed to an atmosphere containing 10 per cent of carbon dioxide. Nitrate accumulation was also much retarded by calcium sulfate in silt loam soil to which 10 per cent of calcium carbonate had been added. Calcium sulfate added to an acid soil equal to 0.02 per cent and 0.1 per cent of the weight of the soil depressed the growth of a nitrate reducing organism. The addition of 0.01 per cent of calcium sulfate had no effect.

The growth of *Azotobacter chroococcum* was not affected by the presence or the absence of calcium sulfate in Ashby's solution. Nitrogen fixation in pure culture of an alkaline and an acid soil was not influenced by the addition of calcium sulfate, and it was not influenced in four normal soils, ranging from alkaline to distinctly acid, over a period of 11 weeks.

Carbon dioxide production in neutral clay and in muck soil was not influenced by calcium sulfate, and this material had no effect on the catalytic power of various soils as measured by hydrogen peroxide decomposition. The residues resulting from the evaporation to dryness of 50-cc. portions of extracts of various soils with saturated calcium sulfate solution decomposed hydrogen peroxide very readily. This was true for all soils except two. Residues from distilled water extracts failed to show this rapid decomposition.

Calcium sulfate had no effect on the acidity of any of the soils studied. The percolates from soils leached from solutions of the sulfate were more acid than those from the same soils leached with distilled water. This was true only for acid soils. Leaching various soils with saturated calcium sulfate solutions did not result in a marked liberation of potassium. A saturated solution of calcium sulfate reacted with a 1 per cent solution of ammonium carbonate to produce calcium carbonate and ammonium sulfate.

Calcium sulfate had a very slight effect on the physical condition of the soil. The water holding ability of various soils was slightly increased, while the hygroscopic moisture capacity was not affected by heavy applications of calcium sulfate in solution form. Wooster silt loam soil was influenced more strongly than any of the other soils leached.

The rate of oxidation of different forms of elemental sulfur, R. H. Simon and C. J. Schollenberger (*Soil Sci., 20 (1925), No. 6, pp. 443–449*).—In studies conducted at the Ohio Experiment Station, the rate of oxidation of different forms of elemental sulfur in different soil types was found to depend upon the surface or fineness. The most complete oxidation was correlated with the highest H-ion concentration. The water-soluble sulfates increased with slight increases of H-ion concentration. The reaction of ammonium sulfate within the soil was completed within the first week. Throughout the entire period of incubation after the first week the H-ion concentration remained practically constant for the untreated soil. The sulfates from the untreated soil indicated that there was practically no sulfur contributed from organic sources.

Potassium ferrocyanide and ferric ferrocyanide as sources of iron for plants, C. G. Deuber (*Soil Sci., 21 (1926), No. 1, pp. 23–26, fig. 1*).—Studies conducted at the University of Missouri are reported which showed that soy bean and *Spirodela polyrhiza* plants made fair growth with 0.033 and 0.066 parts per million of iron in the form of potassium ferrocyanide. Higher concentrations of iron in this salt produced a slow stoppage of growth. Ferric ferrocyanide was a satisfactory source of iron for soy-bean plants when the solution had a reaction of pH 5, but at less acid reactions the growth of the plants and the chlorophyll development were restricted.

Recent experimentation with carbon dioxide as fertilizer [trans. title], H. Fischer (*Angew. Bot., 7 (1925), No. 5, pp. 320–324*).—The author gives a brief account of his resumption during 1925 of work, earlier reports on which have been noted (E. S. R., 47, p. 128; 49, p. 522), and dealing with the possibly injurious effects from soils yielding carbon dioxide in abundance. The plants employed included rye, wheat, peas, lupine, spinach, lamb's-lettuce, dill, parsley, and mustard.

Carbon dioxide fertilization of fields [trans. title], Gerlach and Seidel (*Mitt. Deut. Landw. Gesell., 40 (1925), No. 48, pp. 919–922, fig. 1*).—Experiments are reported which showed that no increases in crop yields were obtained as a result of the use of so-called carbon dioxide fertilizer or of gassing crops with carbon dioxide. Increased yields obtained from the use of stable manure were attributed to causes other than the production of carbon dioxide by this material.

Commercial fertilizers for 1926 (*Md. Univ. Quart. No. 115 (1926), pp. 23*).—A list of fertilizers registered for sale in Maryland for the year 1926 is presented.

Analyses of commercial fertilizers, R. N. Brackett and H. M. Stackhouse (*South Carolina Sta. Bul. 229 (1926), pp. 3–59*).—Guaranties and actual analyses of 1,327 samples of fertilizers and fertilizer materials collected for inspection in South Carolina during the season 1925–1926 are reported.

AGRICULTURAL BOTANY

Plant growth, H. D. Hooker (*Natl. Acad. Sci. Proc., 11 (1925), No. 11, pp. 710–713*).—"To be of use to the physiologist, a formula should be an accurate expression of the process it describes, both quantitatively and with respect to the nature of that process." A formula is presented as capable of being fitted to any simple curve of plant growth, and this is discussed as regards both facts and theory.

The effects of stimulating substances on plant growth [trans. title], H. Behn (*Angew. Bot., 6 (1924), No. 2, pp. 201–224, fig. 1*).—These experiments detail the effects of stimulating fertilizers on the growth of several plants.

The influence of fertilizing factors on the health of grapevines [trans. title], L. RAVAZ and G. VERGE (*Ann. École Natl. Agr. Montpellier, n. ser., 18 [1925?], No. 4, pp. 237–244, pl. 1*).—The intensity of leaf (green) coloration, up to the time when growth is checked, is related to the value of the ratio nitrogen: water of the soil, within the limits between which growth of the plant is possible. As growth ceases, the (green) leaf coloration (as showing health in the vine) depends upon the potassium content, or more strictly speaking, upon the ratio potassium : lime. A very vigorous stock performs, as regards health of the foliage, much the same part as does potassium; so that it is only on the weaker vines that the beneficial effects of potassium are most markedly evident.

Carbon dioxide manuring [trans. title], E. A. MITSCHERLICH (*Angew. Bot., 7 (1925), No. 1, pp. 24–40, figs. 2*).—The studies here outlined and tabulated relate to the effects on rye as regards development of stalk and roots of three factors, air pressure as such, oxygen concentration, and carbon dioxide content.

The law for operation of growth factors and carbon dioxide [trans. title], E. H. REINAU (*Agnew. Bot., 7 (1925), No. 1, pp. 41–46*).—In part this is a discussion of the views of Mitscherlich, as above expressed.

Carbon dioxide manuring [trans. title], H. FISCHER (*Angew. Bot., 7 (1925), No. 1, pp. 52–54*).—Further discussion is given of the views referred to in the article by Mitscherlich above noted.

The ecology of carbon dioxide assimilation by conifers [trans. title], M. G. STÅLFELT (*Meddel. Statens Skogsförsöksanst. [Sweden], No. 21 (1924), pp. 181–258, figs. 25*).—The author in these studies enlarged the scope of those previously noted (E. S. R., 49, p. 728) by working with older conifer needles than those formerly used, also by including investigations of some ecological factors and phenomena, regarding all of which and related matters he has reported in systematic detail. A German summary is included (pp. 249–258).

Effect of potassium acid phthalate on early growth of tomato plants, R. B. DUSTMAN (*Bot. Gaz., 77 (1924), No. 4, pp. 419–431, figs. 6*).—Studies on the use of phthalic acid and its salts have been reported by Tarr and Noble (E. S. R., 48, p. 26). The present author reports five series of experiments said to have been carried out on a small scale.

"Potassium acid phthalate in concentrations of 1,000 or more parts per million is decidedly harmful to young tomato plants grown in sand and water cultures. As measured by dry weight increases of plants grown in sand cultures, its toxic action is appreciable in concentrations of 500 parts per million or less. When applied to soil cultures the opposite effect may occur, and the addition of the phthalate prove beneficial to the growth of the plants. Barley plants give evidence of being somewhat more susceptible to phthalate injury than tomato plants."

Prussic acid application as a measure of stimulation in practical plant industry [trans. title], G. GASSNER (*Angew. Bot., 7 (1925), No. 2, pp. 74–79*).—Use of prussic acid fumes on trees covered with tents as a protection against insects, and experimentally to test for alleged stimulating effects on the trees, is said to have shown decided differences in favor of such application of the gas in ways besides that of protection from pests.

Smoke acid injury [trans. title], A. JANSON (*Angew. Bot., 7 (1925), No. 1, pp. 46–52*).—The desirability and practicability are pointed out of employing a scale of known susceptibilities (or resistances) of various forest trees to injurious acid (smoke) gases (which in 95 per cent of the cases means sulfur dioxide), partly in order to distinguish between such gas poisoning and injury attributable to insects.

The influence of radioactive waters on the germination and development of plants [trans. title], D. VIDAL (*Ann. École Natl. Agr. Montpellier, n. ser., 18 [1925?], No. 4, pp. 245–277, figs. 8*).—Stimulation, varying according to species, is said to have become evident about the middle of the last century and later, in germination and development as the result of exposure of seeds to warm radioactive waters at Plombières. The present account of systematic tests, as presented, shows stimulating effects on wheat, vetch, and mustard. The behaviors of seeds so treated suggest the accumulation of a sort of potential vitality, which may express itself in growth for a month in vetch. Contrary results are also noted.

Climatic effects in the metabolism of the sugar beet, W. E. TOTTINGHAM, S. LEPKOVSKY, E. R. SCHULZ, and K. P. LINK (*Jour. Agr. Research [U. S.], 33 (1926), No. 1, pp. 59–76, figs. 9*).—From the results reported, it is believed that it will be possible to determine the effects of specific climatic factors upon metabolism by means of chemical analysis of the plant tissue at frequent intervals, in this way accumulating data to justify the computation of correlation coefficients. It is believed that conclusive results can be obtained in this way as surely as by the use of special equipment for the control of environmental factors, particularly temperature, atmospheric humidity, and illumination.

The results are presented for diurnal changes of chemical composition in the leaf blades of the sugar mangold and sugar beet, and in the petiole and root of the sugar beet. The percentage of reducing sugars in the leaf blade was found to increase with solar radiation, within limits. Temperature appeared to be a limiting factor in the increase of these sugars when its value approached 30° C. The percentage of soluble protein in the leaf was found to vary in a manner inversely related to temperature and therefore correlated with the fluctuation of reducing sugars. The foliar fluctuations of reducing sugars were found to be distantly paralleled by the deposition of sucrose in the root, while relatively high temperatures increased the percentage of protein stored in this organ. The relations in the petiole were such as to suggest that a high plane of reducing sugars in the plant, together with the presence of nitrates, leads to the formation of amino acids and rest-soluble nitrogen.

These results are held to explain practical observations that cool, fair weather, such as that common in the autumn season, is favorable to the storage of high percentages of sugar in the root of the sugar beet.

Studies on biochemical differences between (+) and (−) sexes in Mucors.—I, Tellurium salts as indicators of the reduction reaction, S. SATINA and A. F. BLAKESLEE (*Natl. Acad. Sci. Proc., 11 (1925), No. 9, pp. 528–534*).—The present paper presents results of one phase of a study of the fundamental differences between sexes. The results are given of tests of the reduction reaction, using the so-called vital reaction of Gosio[1] involving the capacity of the living cell to absorb salts of tellurium and selenium and to reduce them to these elements, as detected by the coloring developed, black and red, respectively. An attempt is made to correlate the variation in power of reduction with the more obvious racial differences, and the results are detailed.

These experiments have established the variability of races of the same age and sex in regard to their ability to reduce these compounds. On the average the (+) sex has a greater power of reduction than has the (−) sex, though as yet no simple and direct relation is evident, so that conclusions drawn

[1] Ztschr. Hyg. u. Infektionskrank., 51 (1905), No. 1. pp. 65–126.

must be based upon the behavior of a relatively large number of individual races.

The physiology of pollen, I–IV, R. A. Brink (*Amer. Jour. Bot., 11* (*1924*), *Nos. 4, pp. 218–228; 5, pp. 283–294; 6, pp. 351–364, pls. 2, figs. 4; 7, pp. 417–436, figs. 3*).—Four papers are here noted.

I. *The requirements for growth.*—A discussion, briefly historical, regarding views and studies of the nature and behavior of pollen, is followed by an account of studies on pollen growth requirements and matters related thereto, these including the chemical composition of pollen and conducting tissue, enzyme relations, artificial culture of pollen, and carbon and oxygen requirements.

II. *Further considerations regarding the requirements for growth.*—This section deals with nitrogen assimilation and the possible rôle of growth-accessory factors, osmotic relations, and the effects of salts, with some remarks on acidity.

III. *Growth in vitro and in vivo.*—This work includes the length of pollen tubes grown on artificial media as compared with the distance from receptive surface to ovary in the plant, nuclear behavior, growth curves, and water in its physical and chemical relations to growth.

IV. *Chemotropism: Effects on growth of grouping grains; formation and function of callose plugs; summary and conclusions.*—A method is described that permits an accurate determination of the rate and amount of pollen-tube growth on artificial media. Other improvement in technique is noted.

Growth-promoting substances in the sterile yeast increase the amount but do not alter the type of growth. They are water soluble, heat stable, and active in small amounts. It is suggested that they may be protein derivatives or possibly of a vitamin nature. The addition of raw potato juice and extracts of gynoecium parts to artificial media regularly increases the growth of pollen tubes. Pollen tubes may utilize cane sugar, and very probably glucose and fructose, as sources of carbon. The bursting of tubes so frequently encountered in the artificial culture of pollen is interpreted as due to osmotic action. Pollen-tube growth is markedly depressed in the presence of small amounts of various inorganic salts or when sea water is added to the culture medium in concentrations as low as 12 per cent. With pollen from Vinca, Scilla, Chionodoxa, Puschkinia, and Muscari, tubes were secured on artificial media as long as, or longer than, the styles of the respective plants. The growth curve of pollen tubes cultured in vitro resembles that of an autocatalytic reaction where the amount of substrate is limited. The digestion of the reserve material contributed to the growing tube by the pollen grain was observed and figured. The view is put forward that the form of the curve describing pollen-tube growth in vitro is dependent in large part upon the course of the autocatalytic reaction involved in the digestion of these reserve food substances.

The difference in form of the growth curves of pollen tubes growing in vitro and in vivo is best interpreted as a result of the difference in the water relations in the two cases. Anatomical features of the style appear to be sufficient to account for the direction of pollen-tube growth therein. Chemotropism has been demonstrated in the pollen tubes of comparatively few forms. Increased growth obtained on culturing pollen on yeast and on yeast-free media is interpreted as the result of the more complete utilization by the groups of some diffusible growth-promoting substance or substances. It was shown that the tips of pollen tubes cut off from the older portions by callose plugs are capable of independent growth. The distribution of nuclei in pollen tubes grown artificially was observed in detail and figured. The literature on the physiology of pollen is reviewed.

The pollinizing mechanism of the potato blossom [trans. title], E. WERTH (*Angew. Bot., 6 (1924), No. 2, pp. 141–151, pl. 1*).—A comparative discussion of certain Solanaceae, more particularly *Solanum* spp., deals with aspects related to fertilization, including insect agency.

[**Fungi growing in resin**], C. CAPPELLETTI (*Ann. Bot.* [*Rome*], *16 (1924), No. 3, pp. 253–296, pl. 1*).—A systematic bibliographical account is given regarding the fungus flora related exclusively or partly to resin, chiefly in the bark of conifers.

Studies on Pyrenomycetes [trans. title], H. W. WOLLENWEBER (*Angew. Bot., 6 (1924), No. 2, pp. 300–313, pl. 1*).—A comparative study is presented, with data chiefly in tabular form.

The life durations and activity periods of nodule bacteria [trans. title], C. STAPP (*Angew. Bot., 6 (1924), No. 2, pp. 152–159*).—This experimentation dealt with *Bacillus radicicola* from a number of legumes as regards its behavior (liquefaction, acidification, and alkalinization) on different media. The results are tabulated.

GENETICS

Heredity, A. F. SHULL (*New York and London: McGraw-Hill Book Co., 1926, pp. XI+287, pl. 1, figs. 111*).—This book presents the fundamental aspects of genetics under the following chapter heads: Heredity and cellular structure, cell division, reproduction and the problems of heredity, final preparation of the germ cells, embryonic development and heredity, simplest cases of monohybrids, monohybrid crosses exhibiting dominance, the back cross, the bearing of maturation upon heredity, dihybrid crosses involving only independent characters, the theory of chance and the production and fertilization of the germ cells, linkage, determination of sex, sex linkage, complicating features of inheritance, modification of inherited characters by environment, non-Mendelian inheritance, variable characters, heredity and evolution, inheritance of structural characters in man, inheritance of human physiological characters, inheritance of mental characters, practical applications of heredity, the eugenics movement, the problem of population, race problems, and immigration.

The theory of the gene, T. H. MORGAN (*New Haven, Conn.: Yale Univ. Press; London: Humphrey Milford, Oxford Univ. Press, 1926, pp. XVI+343, figs. 156*).—This book deals with the fundamental conception of the principles of genetics, taking up particularly those phases relating to the genes and their location in the chromosomes. The present conception of polyploid, sex determination, and the relation of various abnormalities in maturation involving abnormal distributions of the chromosomes in the gametes are discussed with relation to the production of intersexes, sex reversal, and mutations.

The distribution of correlation ratios calculated from random data, H. HOTELLING (*Natl. Acad. Sci. Proc., 11 (1925), No. 10, pp. 657–662*).—The distribution of the correlation ratios of samples of uncorrelated material is found in this contribution from Stanford University. The result holds also for the multiple correlation ratio.

On photographing chromosomes, J. BELLING (*Jour. Roy. Micros. Soc., 1925, No. 4, pp. 445, 446, fig. 1*).—Clear pictures of the chromosomes of plants may be obtained by squeezing them out of the pollen mother cells to a cover glass. The materials required for this work are listed.

Elimination of chromosomes due to a mutant (Minute-n) in Drosophila melanogaster, C. B. BRIDGES (*Natl. Acad. Sci. Proc., 11 (1925), No. 11, pp. 701–706, fig. 1*).—Various crosses are described which indicate that a factor

(Minute-n) located in the X chromosome, tended to cause the elimination of this chromosome and in two cases influenced the elimination of all maternal chromosomes.

Segregation, W. BATESON (*Jour. Genetics, 16 (1926), No. 2, pp. 201–235*).—The author has made a wide survey of the behavior and segregation of factors in the determination of characters in plants and animals. It is recommended that the complete acceptance of the chromosome theory, with its many extensions and implications, be postponed until more positive proof of many of the hypotheses is available. The importance of the part played by somatic differentiation in the solution of the problem of heredity and variation is pointed out, and it is suggested that the most fruitful progress in genetic research is likely to come in these fields in the future.

Segregation in aberrant sweet clover forms, L. E. KIRK (*Sci. Agr., 6 (1926), No. 7, pp. 233–235, figs. 2*).—The sweet clover segregates in families derived from aberrant forms found in Arctic sweet clover (E. S. R., 53, p. 129) almost invariably possessed the characteristic sweet clover taste, while it varied with the aberrant segregates from considerable to almost complete absence. Typical plants of the two types of segregates from each family are illustrated.

Bud variation and chimeras in Matthiola incana R. Br., H. B. FROST (*Jour. Agr. Research [U. S.], 33 (1926), No. 1, pp. 41–46, figs. 3*).—A contribution from the California Experiment Station upon the genetics of Matthiola. Of three cases of somatic variation and two of intermediate double flowers, four are believed due to trisomic forms undergoing changes to or toward the normal diploid type. In three of the plants the loss of trisomic characters was accompanied by a change from single to double flowers. In two plants the author believes that a periclinal, single-double chimera was formed, as indicated by the intermediate condition of the double flowers and a further change in one plant to fully double flowers. The author believes that the bud variations observed were due to the loss of a single chromosome which carried the genes necessary for single flowers. The production of intermediate blooms is thought due to the same cause.

The sex-linked mutants vesiculated and semi-lethal in Drosophila melanogaster, K. EVANG (*Ztschr. Induktive Abstam. u. Vererbungslehre, 39 (1925), No. 2, pp. 165–183, fig. 1*).—In breeding experiments with *D. melanogaster* at the University of Oslo, a factor causing vesicles on the wings has been found. In crosses with eosin vermilion flies this factor was located at 16.0 in the X chromosome. In crosses involving flies from an unrelated stock some of the genetically vesiculated flies failed to exhibit the character which was assumed to be due to minus modifiers. A new sex-linked semilethal factor located at 7.2 was also discovered. Occasionally lethal-carrying males survived, but they were feeble and absolutely sterile.

Haploidy in Drosophila melanogaster, C. B. BRIDGES (*Natl. Acad. Sci. Proc., 11 (1925), No. 11, pp. 706–710, figs. 2*).—The occurrence of two mosaic individuals in which the irregular appearance of certain portions of the body is explained on the basis of haploid tissue confirms the hypothesis that haploid individuals were female (E. S. R., 53, p. 524).

Further observations on polydactyly and heterodactyly in fowls, C. J. BOND (*Jour. Genetics, 16 (1926), No. 2, pp. 253–256, pls. 2*).—Further accounts of the production of polydactylous and heterodactylous birds among the F_1, F_2, F_3 offspring of a cross between an Andalusian cock (4 toes) and Houdan hens (5 toes) are given (E. S. R., 44, p. 469). There appeared among

the offspring individuals with 4, 5, or 6 toes on both feet, as well as asymmetrical birds with 4 to 6 toes on one foot and 5 on the other. An extra metatarsal bone also appeared in one bird. The data tend to substantiate the hypothesis that the factor which controls the development of the fifth digit is not specific but may influence a doubling of other digits. Conditions favoring such a generalized action of this factor seem to appear when a 5-toed bird is crossed with a 4-toed bird.

On the pattern of the Dutch rabbit, R. C. PUNNETT and M. S. PEASE (*Jour. Genetics, 15 (1925), No. 3, pp. 375–412, pls. 9, figs. 3*).—The results of further experiments on the inheritance of the pattern of the Dutch rabbit (E. S. R., 44, p. 363) are reported. These experiments have indicated that the variations in this pattern may be interpreted on the basis of four pairs of factors, *P*, *S*, *T*, and *N*, and that at least the first three are transmitted independently. It is suggested that further modifying factors may also be operative.

On the pattern of the Dutch rabbit: A discussion of the results of Punnett and Pease, W. E. CASTLE (*Jour. Genetics, 16 (1926), No. 2, pp. 189–196, figs. 2*).—The author points out that the results of his experiments on the inheritance of pattern in the Dutch rabbit and those of Punnett have shown close agreement, but he has explained the mode of inheritance as due to several allelomorphic forms of the Dutch gene itself and to the modifying action of other genes (E. S. R., 42, p. 762), while Punnett and Pease, in the article noted above, consider the Dutch pattern to be due to the combined action of four pairs of independent genes. The results of a cross of a White Dutch race with a self race given in the previous publication show typical monohybrid ratios, especially in the back crosses of the F_1s with the White Dutch (recessive) parents.

In further experiments in which the White Dutch rabbits were Angora and the self parents had short hair, evidence of linkage of these characters was apparent in the back cross of the F_1 with the recessive. Of 123 such young produced, 60 were White Dutch, of which 11 were short haired and 49 were long haired. Of the 63 resembling the F_1 parents, 54 were short haired and 9 were long haired. The crossover percentage based on a total of 1,213 back-cross young produced in such experiments has been calculated at 14.26±0.96.

Evidence is further presented to show that the different types of the Dutch pattern are due to three genes, allelomorphic to self. Certain independent factors of Punnett and Pease are considered to be the same as those suggested as modifiers by the author. The Tan Dutch rabbit previously described is considered as due to the action of modifiers (darkeners) of the Dutch pattern derived from the self ancestors.

The Dutch rabbit—Castle, Pease, and Punnett, R. C. PUNNETT (*Jour. Genetics, 16 (1926), No. 2, pp. 197–199*).—In answering the above paper the author believes that the Dutch pattern can be explained on the basis of a single pair of genes, the one *P* or du_d being responsible for dark Dutch and its allelomorph *p* or du_w determining White Dutch. The action of modifying factors has been admitted by both parties, and such modifiers may change dark Dutch to self, although Castle appears to believe that another allelomorphic factor is necessary in the series for the production of self individuals.

The melanotic pigment of the hide of the gray domestic mouse [trans. title], A. STEINER-WOURLISCH (*Ztschr. Wiss. Biol., Abt. B, Ztschr. Zellforsch. u. Mikros. Anat., 2 (1925), No. 3, pp. 453–479, figs. 8*).—The results of a histological study of the location of pigment in the skin of the gray domestic mouse with reference to the dopa reaction are given. Two types of pigment cells were found in the skin of mice, those of the epidermis to which the hair pigments belong and the cutaneous pigments. Both give positive dopa reactions, but

there appeared to be no overlapping of the two types. Chromatophores could not be detected in the cutis.

The inheritance of horns in the goat, S. A. Asdell and F. A. E. Crew (*Jour. Genetics, 15 (1925), No. 3, pp. 367–374*).—An analysis of the inheritance of horns in goats based on the records of the British Goat Society and of private herds indicates that the horned condition acts as a simple recessive to the polled character as in cattle rather than as in sheep. The mode of inheritance of scurs could not be determined from the available data.

Studies on the inheritance of milk production based on 50 years' milk records [trans. title], C. F. von Patow (*Ztschr. Tierzüchtung u. Züchtungsbiol., 4 (1925), No. 3, pp. 253–329, figs. 2*).—A statistical study has been made on the milk production of 601 cows which were in a herd for which records have been kept by the same family since 1873. Due to variations in the length of the lactation periods and dry periods certain corrections seem desirable for the treatment of these data. The production of the cows having the more normal and reliable lactation periods was classified in groups according to their average daily production for a year, and it was found that the distribution fitted very closely to the normal curve of variability. A classification of the cows descended from individual females indicates that the inheritance of milk production is controlled by multiple factors. At least three pairs of factors are suggested as responsible, none of which appear to be sex-linked. The records of each of the 601 cows are given, together with the length of the lactation and dry periods in each year, as well as the assumed genetic formula considering three pairs of factors responsible for milk production.

Consequences of Mendelism on the problems of in-breeding in livestock, J. Baashuus-Jessen (*Hereditas, 7 (1926), No. 2, pp. 189–214*).—The author has suggested a method of measuring the degree of inbreeding in which animals appearing more than once in a 12-generation pedigree are valued according to the percentage of the total number of animals in each generation in which the animals appearing more than once occur. Acccording to this system, the measure of inbreeding may vary from 1 to 100 per cent. Close inbreeding is limited to from 75 to 100 per cent, mild inbreeding to from 50 to 75 per cent, close line breeding to from 25 to 50 per cent, and mild line breeding to from 1 to 25 per cent. The measure of outbreeding is the difference between the inbreeding coefficient and 100. Evidence is presented which leads the author to believe that this means of measuring inbreeding tends to indicate the probable accumulation in a descendant of the factor complex of a prepotent ancestor.

In the second portion of the paper the author shows that the closest form of inbreeding is by parent-offspring matings, since the qualities of single individuals are concentrated in this way, while brother and sister matings allow for segregation of family characteristics in each generation. Examples of Wright (E. S. R., 48, p. 469) showing the variations in the amount and location of color markings are taken to indicate that segregation is still occurring even after 12 to 19 generations of inbreeding in guinea pigs. It is noted that many of the noteworthy foundation animals of the breeds of livestock were developed by so-called back-cross inbreeding. The wide diversity in the methods employed by practical stockmen with the different breeds of livestock indicates the need of research in animal breeding.

Studies in the inheritance of resistance and susceptibility to crown rust (P. coronata corda) in a cross between selections of Red Rustproof (A. sterilis L.) and Scotch Potato (A. sativa L.) [oats], D. W. Davies and E. T. Jones (*Welsh Jour. Agr., 2 (1926), pp. 212–221, pls. 4*).—Resistance in the F_1 generation of Red Rustproof oats (resistant) × Scotch Potato (susceptible)

behaved as a partially dominant character, and the F_2 segregated in the ratio of three resistant to one susceptible.

Inheritance of chemical characters—dent and sweet corn (*Iowa Sta. Rpt. 1925, p. 46*).—Chemical analyses of hybrid generations of Iodent×Evergreen (E. S. R., 53, p. 730) demonstrated that the carbohydrate chemical characters follow a definite system of hereditary transmission. Quantitative determinations showed that the effects of the triple fusion in the endosperm of corn are directly evident in the amount of sugars, dextrins, and starches produced by this mechanism. Apparently sweet corn may be crossed with field corn to increase the yield of the former without seriously diminishing the sugar content.

Notes on linkages in maize, M. Demerec (*Amer. Nat., 60 (1926), No. 667, pp. 172–176*).—Genetic studies with corn by the Carnegie Institution showed linkage relations between the factors $W_{11} w_{11}$ and *Shsh* with 22 per cent of crossing over, $D_3 d_3$ and *Shsh* with 23 per cent, $Gm_2 gm_2$ and *Rr* with 31 per cent and $V_5 v_5$ and *Susu* with 33 per cent.

On the sexuality of the right ovary of birds, O. Riddle (*Anat. Rec., 30 (1925), No. 5, pp. 365–382, pl. 1*).—The sexuality of the right ovary of birds is discussed from the evidence presented in the literature and from data collected at the Carnegie Station for Experimental Evolution at Cold Spring Harbor, N. Y., on fowls, pigeons, and doves.

The evidence indicates that the right ovary of birds frequently persists, and that its character is normally ovarian. The development of testicular tissue in the rudimentary right ovary by chicks ovariectomized on the left side by J. Benoit[2] is suggested as not showing that the constitution of this ovary is male, but rather indicates that the two sides of the body are not equally favorable for the development of the testes and ovaries and that the testicular tissue develops favorably and the ovarian tissue unfavorably in the right side of the birds. There is no evidence of sex chromosome differences in the right and left ovaries.

Development of the egg of Gallus domesticus in vitro, J. P. M. Vogelaar and J. B. van den Boogert (*Anat. Rec., 30 (1925), No. 5, pp. 385–394, pl. 1*).—A brief account is given of experiments at the University of Leyden, in which hen's eggs have been developed as far as five days in vitro by breaking the eggs in sterile covered dishes and completely submerging the yolks with additional egg albumin and salt solution. Spontaneous movements of the embryos were observed at the later stages of development, but rupture of the yolk membrane has always occurred during development in vitro.

FIELD CROPS

[Agronomic work in Hawaii, 1925], J. C. Ripperton and H. F. Willey (*Hawaii Sta. Rpt. 1925, pp. 11–14, 16, 17, 18, fig. 1*).—Additional experiments (E. S. R., 54, p. 131) reported on included production tests with pigeon peas, purple vetch, sorghum, edible canna, varieties of taro, potatoes, sweet potatoes, peanuts, and pop corn, and forage grasses. Edible canna investigations embraced studies of characteristics, growth, and chemical composition of the tubers, observations on the starch in the plant and tuber and on its utilization, and cultural, irrigation, and fertilizer tests.

Variety tests of field crops at Ridgely, J. E. Metzger and A. White (*Maryland Sta. Bul. 281 (1926), pp. 203–214, figs. 3*).—Reid Yellow Dent, Johnson County White, and Thomas corn, the Fulcaster group of wheat varieties, and Virginia and Wilson soy beans are reported as outstanding in variety trials

[2] Compt. Rend. Acad. Sci. [Paris], 178 (1924), No. 3, pp. 341–344.

at the Ridgely Substation. The fertility of the soil, as indicated by enhanced corn yields, appeared to gradually increase under the 3-year rotation corn, wheat, and mixed hay during the 9 years of the tests. Cultural recommendations deemed suitable for the Eastern Shore region of Maryland are included.

Field crop variety trials on the Coon Creek peat experimental fields, 1919–1925, A. C. Arny and F. W. McGinnis (*Minnesota Sta. Bul. 228 (1926), pp. 5–42, figs. 12*).—Outstanding among varieties of field crops tested on peat lands were Minnesota No. 13 and Rustler corn, Blue Prussian and Golden Vine field peas, Minsoy soy beans, Robust field beans, Rosen and Swedish No. 2 rye, Iowar oats, Minsturdi and Lion×Manchuria barley, emmer (of the spring wheats), N. D. Resistant No. 114 flax, Silverhull buckwheat, and Kursk and Red Turghai (proso) millet. Mangels, rutabagas, and turnips led the root crops on the green weight basis, whereas sugar beets and rutabagas followed by mangels and carrots produced the highest yields on the 18 per cent moisture basis.

The hay yields from seedings of grasses, clovers, and mixtures are tabulated and discussed, and the results of rate of planting tests with sunflowers, rye, oats, and flax and a date of seeding trial with flax are reported.

[Field crops experiments in Mississippi, 1924], J. F. O'Kelly, J. C. C. Price, C. B. Anders, W. E. Ayres, and C. T. Ames (*Mississippi Sta. Rpt. 1924, pp. 6–8, 20, 35, 37–40, 41, 42*).—Investigations with field crops at the station (E. S. R., 52, p. 226; 53, p. 234) are described with accounts of experiments at the Holly Springs (E. S. R., 53, p. 131), South Mississippi (E. S. R., 53, pp. 33, 35; 53, p. 231), and Raymond (E. S. R., 53, p. 332) Substations, largely noted elsewhere. Variety and cultural tests with cotton, corn, oats, and soy beans; fertilizer trials with cotton; and breeding work with cotton, corn, and soy beans are also reported on from the Delta Substation (E. S. R., 54, p. 533; 55, p. 334).

High ear and long husk strains of corn yielded 1.5 and 2.3 bu., respectively, more per acre than low ear and short husk strains. While the long shank strain yielded 0.7 bu. less than short shank, the averages favor the former. No form or quantity of lime showed consistent gains when applied for corn, oats, and cowpeas. Ammonium sulfate, sodium nitrate, and calcium cyanamid increased corn yields in the order given. Grown alone, cowpeas, velvet beans, and soy beans increased the yield of a subsequent crop of rye 47.1, 42.9, and 21 per cent, respectively, whereas when the legumes were grown with corn the rye yield was increased 36.6, 32.9, and 23.1 per cent, respectively. Removing the entire soy bean plant grown with corn reduced the subsequent rye yield slightly. More corn was produced by ordinary than by deep or shallow cultivation, and by 6 and 8 plowings than by 4 plowings. Laredo and Otootan soy beans, Rustproof strains of oats, and Triumph sweet potatoes continued to be outstanding.

[Field crops investigations in North Dakota, 1923–1925], H. L. Walster, T. H. Hopper, L. Moomaw, O. A. Thompson, and L. Jorgenson (*North Dakota Sta. Bul. 194 (1926), pp. 9–20, 21–23, 54, 80–82, 84, 89, figs. 7*).—Varietal trials with wheat, oats, barley, corn, flax, soy beans, field peas, alfalfa, and sweet clover; breeding work with wheat, oats, rye, flax, corn, alfalfa, and brome grass; studies of earliness of maturity in corn varieties (E. S. R., 54, p. 330); tests of flax-wheat mixtures; cooperative tests with treble superphosphate; and tillage and rotation experiments (E. S. R., 53, p. 333), are reported on from the station and substations as heretofore (E. S. R., 51, pp. 832, 833).

No regular relationship was apparent between the annual yields on a plat cropped continuously to hard red spring wheat for 42 years and either May or

June temperatures except that all yields below 10 bu. occurred with abnormally high May and June temperatures. German millet residues appear to have a detrimental effect upon the succeeding wheat crop in most seasons in the 4-year rotation corn, barley, millet, and wheat. This effect is reflected in reduced yields. Nitrification seemed slow on both wheat and corn plats in this rotation. Physical studies indicated that the millet residues have caused a deflocculated condition of the soil. Crop sequence studies suggested that while the immediately preceding crop probably affects the yield most, some of the effect may be due to other crops in the rotation.

Local well-graded Marquis wheat, although low in test weight, was preferable to high-test Marquis from Canada. Protein tests of the crop grown from Marquis samples with different protein contents, collected from different regions and grown locally, generally indicate that climate and soil are the principal factors influencing the protein content of the grain. Early harvesting of rusted Marquis wheat did not show that rusted wheat should be harvested earlier than wheat not rusted. Trials of flax-wheat mixtures so far have not favored mixed cropping as a general practice.

Statistical examination of stand and tiller counts on wheat and barley plats from crop rotation and fertility trials showed a decided positive correlation between yield and degree of tillering. While stand and degree of tillering are probably positively correlated, this correlation is less significant than that between yield and tillering, i. e., the soil condition as affected by the rotation and immediate crop sequence is distinctly more active in influencing tillering than the space allotted to each plant. Stand of plants and yield were not significantly correlated. See also another report by Smith (E. S. R., 54, p. 635).

To estimate the influence of rotations, manure, and fertilizers, the ratio of the part of the total corn crop ripe October 3, 1924, to the total harvest was determined. Statistical examination of the data suggested a slight negative correlation between yield per acre and maturity and a slight positive correlation between the application of phosphates and earliness of maturity, but no correlation between type of rotation and earliness of maturity.

A decreased yield of both soy beans and corn occurred in mixtures as compared to the crops grown separately. Field peas appeared to be injured much more seriously than soy beans by excessive soil moisture.

Field work of the Ohio Agricultural Experiment Station, Wooster, Ohio (*Ohio Sta. [Pamphlet], 1926, pp. 16, figs. 2*).—Designed as a visitors' guide to agronomic experiments at the station, this pamphlet tabulates the average yields of varieties of winter and spring wheat, oats, barley, corn for grain and silage, flax-cereal mixtures, and soy beans for seed and hay; gives the results of seeding trials with oats and wheat and tests of seed bed preparation and straw top-dressing with wheat; and summarizes experiments showing the response by crops to fertilizers, lime, manure, and crop rotations.

The service of statistical formulae in the analysis of plat yields, J. A. Harris (*Jour. Amer. Soc. Agron., 18 (1926), No. 3, pp. 247–273, figs. 7*).—This is a revision of the paper noted earlier (E. S. R., 48, p. 195).

Composition of grass from woodland and from open pasture, F. A. Welton and V. H. Morris (*Jour. Amer. Soc. Agron., 18 (1926), No. 3, pp. 226–238*).—Open (cleared land) and woodland (among trees) pastures seeded to blue grass were compared with respect to their relative yield and quality in studies by the Ohio Experiment Station.

The light in old unfertilized pasture ranged from 76 to 90 per cent less than in the open field, the temperature measured from August 23 to October 3 showed a range of 21.5° F. in the woods and 34.9° in the open, and in the

woods remained lower in the daytime and higher in the night. The evaporation from July 1 to October 21, inclusive, was 29.5 per cent less in the woods than in the open.

Under such growth conditions the woodland pasture had 32 per cent more weeds, yielded 85 per cent less dry matter, and pound for pound of actual blue grass contained 22 per cent less total nutrients than the open pasture. The total carbohydrates found in the green material of the native woodland grass was 38 per cent less than in the native grass adjoining but grown in the open. The greatest difference was in the inverted sugars.

The difference in quality found in new seedings of woodland and open pasture confirmed that found in the old pasture. Further confirmation appeared in the differences in quality of shaded and unshaded grass grown in the manured pasture but shaded artificially. Thus indications are that in all three series the differences found in grass quality were due chiefly to variations in the light.

The carbohydrates in grass grown around manure droppings were 47 per cent less in amount than were found in unfertilized grass near by. In view of the known unpalatability of such grass, and since similar reduction in carbohydrates was noted in the woodland pasture, some basis may exist for the claim that woodland pasture is less palatable than open pasture.

Inoculation of legumes and nonlegumes with nitrogen-fixing and other bacteria, F. Löhnis and L. T. Leonard (*U. S. Dept. Agr., Farmers' Bul. 1496 (1926), pp. II+28, figs. 19*).—Popular information is presented on the inoculation of legumes and nonlegumes with nitrogen-fixing and other bacteria, the merits of inoculation methods, and on the use of mineral fertilizers with inoculated seed.

Cultural experiments with wheat, oats, and buckwheat, T. E. Odland (*West Virginia Sta. Bul. 200 (1926), pp. 14, figs. 5*).—Seeding experiments during several years gave results recommending acre rates of 6 pk. for winter wheat, 8 to 10 pk. for early oats, and 3 or 4 pk. for buckwheat. Wheat seeded from September 10 to 30 produced the highest yields, but wheat should not be seeded earlier than about September 25 in order to escape Hessian fly infestation. Buckwheat seeded July 10 and 20 produced better average yields than that seeded earlier or later.

Alfalfa hay production tests (*Iowa Sta. Rpt. 1925, pp. 14, 15*).—Results of tests to date indicate that alfalfa hay is considerably less palatable and less nutritious when cut only twice during the year than when cut three times. The best practice in Iowa may be to cut three times annually and expect to plow the alfalfa up after three or four years, getting the manurial value of the crop in a rotation.

Investigations with strains of beans, E. E. Down and H. M. Brown (*Michigan Sta. Spec. Bul. 156 (1926), pp. 9, figs. 5*).—Trials of numerous strains of field beans showed Robust to lead Michigan strains in production. Two selections of Mexican Tree also gave good yields. Shelling at harvest in the 1925 season after the beans were pulled varied from a trace to 11.6 per cent. The incidence of precipitation and rust seemed to influence yields. Seeding trials during 5 years indicate 40 to 50 lbs. per acre to be a suitable rate for strain 40520 of Robust on average soils.

Varietal experiments and first generation crosses in corn, R. J. Garber, T. E. Odland, K. S. Quisenberry, and T. C. McIlvaine (*West Virginia Sta. Bul. 199 (1926), pp. 29, fig. 1*).—The leading sorts in comparisons of corn varieties and F_1 hybrids made during the period 1921–1924 on the agronomy farm of the station included Leaming, Reid Yellow Dent, Woodburn White Dent, and Boone County White in shelled corn production, and Cocke Prolific, Woodburn

White Dent, Knight White, and Boone County White for air-dry forage and at the Maggie Substation Woodburn White Dent. Cooperative trials in Berkeley, Hardy, Greenbrier, Mercer, Brooke, and Randolph Counties showed that in general local high-yielding varieties or strains of corn produce as well as, and sometimes better than, high-yielding introduced varieties or strains.

The total average yields of protein, fat, and nitrogen-free extract of the several varieties grown on the agronomy farm nearly corresponded to the average yields of air-dry forage. Mammoth Russian sunflowers produced the highest average yield per acre of green forage, but on the air-dry basis averaged next to the lowest of the varieties tested. The sunflowers produced relatively more fat and crude fiber in proportion to the amount of dry forage than did any of the corn varieties.

Cotton: Partial list of publications in English, compiled by E. B. HAWKS (*U. S. Dept. Agr., Agr. Libr. Notes, 1 (1926), No. 6, Sup., pp. 12*).—This mimeographed compilation lists about 100 books and pamphlets and also indicates the publications of the U. S. Department of Agriculture and other Government agencies concerned with cotton. Works on diseases and pests and publications of the State experiment stations are not included.

Is it advisable to use oversized potatoes for seed purposes? P. M. LOMBARD (*Amer. Potato Jour., 3 (1926), No. 4, pp. 117, 120*).—Overgrown Irish Cobbler and Green Mountain tubers were compared with the average run of stock left after the removal of overgrown and undersized tubers. The tubers were all cut to 2-oz. sets, but in one of the three years all eyes except one were removed from each set prior to planting. The 3-year average weights for the Irish Cobblers were 15.9 oz. for the oversized seed and 4.6 for the medium seed and for the Green Mountains 14.7 and 6.1 oz., respectively.

Notwithstanding the marked differences in average weight of oversized and medium sized tubers of both varieties, there were no appreciable differences in germination. Interesting differences between the Irish Cobbler sets of the first two seasons were nullified when only one eye was left on each set. A fairly distinct correlation existed between the number of stems and the percentage of culls produced by Irish Cobbler in the first two seasons. The yields as a whole seemed to indicate that no appreciable difference exists between the same weight sets from oversized and medium sized tubers. Except that more pounds of oversized tubers are needed to plant an acre, their lack of salability makes them a cheaper source of seed than tubers grading U. S. No. 1.

Report of the potato synonym committee on the potatoes sent for immunity trials to the potato testing station, Ormskirk, Lancashire, 1925, R. N. SALAMAN ET AL. (*Jour. Natl. Inst. Agr. Bot., No. 5 (1926), pp. 22–28*).—Examinations of potato varieties are reported on and the incidence of wart disease indicated.

Some panicle characters of sorgo, H. B. COWGILL (*U. S. Dept. Agr. Bul. 1386 (1926), pp. 38, pls. 16, figs. 2*).—Investigation of the varietal characters in sorgo varieties grown by the Office of Sugar Plants of this Department during the years 1918–1924 is reported on, with descriptions and a synopsis of the varieties studied. Plant characters are commented on briefly, while the characters of the panicle are treated in detail. The panicle appears to be of greater value for purposes of classification and identification than the vegetative parts. The literature concerned with varietal differences in sorgo is reviewed.

Comparative experiments with sugar beets in Czechoslovakia [trans. title] (*Ztschr. Zuckerindus. Čechoslovak. Repub., 50 (1926), Nos. 23, pp. 185–192, fig. 1; 24, pp. 193–199; 25, pp. 201–208, figs. 2*).—Ten strains of sugar beets, 4 from native seed and 5 from foreign seed, were compared in 1925 on 48

fields in different localities in Czechoslovakia. Buszczyński M. I., Dippe W. I., Zapotil I, and Buszczyński E. P. led in sucrose content; Knoche, Dobrowitz, and Zapotil I and II gave the highest yields of beets per unit area; and Dobrowitz and Zapotil selections produced the most sugar per hectare.

Fertilizing sugar beets with ammonium sulfate [trans. title], F. MÜNTER (*Zuckerrübenbau, 8 (1926), No. 2, pp. 21–24*).—Review of fertilizer experiments involving the application of nitrogenous salts to sugar beets led the author to conclude that while sodium nitrate produces more certain yields of beets, for reasons of economy and to maintain a better mechanical soil condition nitrogen can well be applied in two forms. With the deep, better soils and in dry localities either ammonium sulfate or calcium cyanamide may be plowed in during fall or winter and sodium nitrate applied in the spring. On lighter soils or in humid regions half of the nitrogen may be applied as ammonium sulfate or cyanamide some time before planting and the remainder as sodium nitrate at planting or later. Top-dressing with sodium nitrate should not be made later than June 1.

Planting sugar cane [trans. title], A. H. ROSENFELD (*Rev. Agr. Puerto Rico, 16 (1926), No. 2, pp. 67–71, figs. 2*).—Consideration of results of experiments in Tucumán, wherein thick and slender stalks of seed cane of the Louisiana Purple and Louisiana Striped varieties were compared without appreciable differences in yield per unit area, led to conclusions similar to those recorded earlier (E. S. R., 40, p. 532) that the relative size of stalk is not an index to hereditary potentialities.

The most important loss in making sugar from Java sugar canes [trans. title], W. E. CROSS (*Estac. Expt. Agr. Tucumán Circ. 16 (1925), pp. 7; also in Rev. Indus. y Agr. Tucumán, 16 (1925), No. 3–4, pp. 46–50*).—Means of avoiding losses of sugar caused by delay in transporting the cut sugar cane from the fields to the mills are suggested. Varietal differences in the rate of deterioration after cutting are to be seen, Java canes commonly grown in Argentina, e. g., P. O. J. 36 and 213, deteriorating quite rapidly. Where the plantations are distant from the mills, the author recommends planting such varieties as D–1135, P. O. J. 228, purple and striped Criolla, and especially P. O. J. 2725, which appears to be the best for the majority of soils. These do not suffer pronounced inversion after cutting.

A study of seed coats and delayed germination in the sweet clovers (*Iowa Sta. Rpt. 1925, p. 35*).—About 3 months' exposure to winter weather appeared necessary to cause a high percentage of germination in sweet clover seed. Unscarified seeds exposed all winter to variations in moisture and temperature germinate about March 15 in central Iowa and hence are in great danger of being killed by later freezes. Around 50 per cent of seeds stored dry but subject to the fluctuations of winter temperatures open their coats the first year and nearly 100 per cent when exposed to two winters. When the seeds are stored for several years in a temperature maintained above freezing their coats open very little.

The nitrogen and dry matter content of sweet clover tops and roots at various stages of growth, H. J. SNIDER and M. A. HEIN (*Jour. Amer. Soc. Agron., 18 (1926), No. 3, pp. 273–280, figs. 2*).—The nitrogen and dry matter contents of tops and roots of sweet clover at different growth stages were determined from material grown on the Spring Valley experiment field of the Illinois Experiment Station.

When spring seeded in small grain crops, biennial white sweet clover developed much organic matter in both roots and tops during the summer, fall, and following spring. Roots reached their maximum development both

in depth and bulk during the fall of the first season, while tops attained their maximum bulk when the plant reached maturity during the following summer. The crop approached its maximum in total nitrogen per acre in the fall of its first season, and this remained practically constant during the early part of the following spring.

According to a 2-year monthly average, the sweet clover contained at maturity the maximum amount of nitrogen per acre, this being largely in the coarse, heavy top growth. The highest percentage of nitrogen was contained in the roots during the fall and winter, while in the spring and summer growth the tops held the highest percentage. The dry matter and nitrogen carried over winter in the summer and fall top growth of the first season seemed significant from the viewpoint of fertility.

Sweet potato culture in the coastal plain of Georgia, O. WOODARD (*Georgia Coastal Plain Sta. Circ. 4 (1926), pp. 16*).—Practical information considered suitable for sweet potato culture in south Georgia deals with soil and fertility requirements, varieties and seed, growing slips, cultural and field practices, harvesting, grading, storage, and diseases.

Factors influencing results from rate- and date-of-seeding experiments with wheat in the western United States, J. H. MARTIN (*Jour. Amer. Soc. Agron., 18 (1926), No. 3, pp. 193–225, figs. 5*).—Extensive consideration of data from rate- and date-of-seeding tests made with winter and spring wheats at 17 experiment stations in the Great Plains and Great Basin areas during 17 years, together with meteorological and other environmental data, led to the conclusion that the optimum rate of seeding for wheat is practically independent of soil type, moisture, locality, date of seeding, cultural treatment, and variety. While the optimum date of seeding for winter wheat appears to be independent of soil type, annual precipitation, variety, and rate of seeding, it is related somewhat to temperature, even though the same temperature conditions do not apply in all sections. Rates of from 4 to 6 pk. per acre have generally produced the highest net yields of winter and spring wheat. Early seeding of spring wheat and medium seeding of winter wheat usually are most favorable.

[Milling and baking studies with wheat in North Dakota], C. E. MANGELS (*North Dakota Sta. Bul. 194 (1926), pp. 69–75, figs. 6*).—Further studies (E. S. R., 51, p. 834) continued to show durum wheat varieties to be decidedly inferior to hard red spring varieties in baking quality. Tests involving the viscometer indicated that durum wheats as a class show much lower viscosity than the hard red spring type. In loaf volume and texture score Preston or Velvet Chaff was distinctly inferior to such varieties as Marquis, Ruby, and Kota. Burbank wheat from plats at Fargo and Dickinson averaged lower in loaf texture than Marquis. The baking quality of Burbank wheat has seemed very erratic; its gluten differs markedly in physical properties from that of Marquis, and the results of viscosity tests on Burbank resembled those obtained from durum wheats.

Surveys indicated that the 1923 wheat crop was high in protein, the average of all samples collected being 13.2 per cent as compared with 11.33 in 1924, probably the lowest in protein since 1915. Additional tests on the macaroni qualities of durum varieties confirmed previous results. Durum starches were found to differ from common wheat starches in being more readily attacked by wheat diastase.

Report of operation, State testing mill, crop season of 1923, C. H. BAILEY and R. C. SHERWOOD (*Minn. Dept. Agr. Bul. 37 (1924), pp. 25, figs. 4*).—Sixty lots of the 1923 crop of hard spring wheat, 50 from Minnesota, were milled during the season.

The weight per bushel was less than in the preceding crop (E. S. R., 52, p. 736), and the flour yield was correspondingly lower. The percentage of protein (largely gluten) and the baking strength of the flour were higher than in 1922 but lower than in 1921. No. 1 northern spring wheat flour contained more protein than flour from No. 1 dark northern spring wheat, which suggested the inadequacy of classifying spring wheats on the basis of density or the relative proportion of vitreous kernels present. The same seasonal variation in moisture content of the flour as noted in 1921 and 1922 was observed. During the first 7 months of 1924 the flours produced during April averaged highest in moisture content.

Three per cent or more of rye mixed with wheat reduced the quality of the flour, and a mixture of 10 per cent or more of durum wheat with spring wheat unfavorably affected the quality of the resulting flour in comparison with pure spring wheat flour. The merits of flour from Kota wheat and from the white wheat, Burbank Quality or White Pearl, are indicated. Progress is noted in the direction of improving the baking quality of flour milled from a certain type of hard red winter wheat grown in the Northwest by adding a small percentage of germinated wheat kernels to the wheat mixture before milling.

Report of operation, State testing mill, crop season of 1924, R. C. Sherwood (*Minn. Dept. Agr. Bul. 50 (1925), pp. 31, figs. 6*).—Fifty-five lots of hard spring wheat of the 1924 crop, 50 originating in Minnesota, were tested during the season. Lots of wheat grading northern spring predominated, due in part to late summer and fall rains which bleached the wheat in shocks. Since much of the wheat grading northern spring was high in protein, northern and dark northern spring of the same grade and protein content did not differ in price during most of the season.

Marked difference in flour yield and yield and value of total products was not apparent when the averages of samples of No. 1 hard spring, No. 1 dark northern spring, and No. 1 northern spring were compared. The last two were somewhat superior to the No. 1 hard in these respects and also in baking quality. Although the weight per bushel was higher than in the three previous seasons, the flour yield was not, due very largely to the moisture content of the wheat, which averaged 13.48 per cent. The yield of total products was also less than in previous seasons.

The average protein content of the 1924 crop, as indicated by samples, was 11.64 per cent, nearly equaling the 1922 crop, and less than that of the 1923 crop. The baking quality of the 1924 crop samples, as judged by loaf volume, surpassed the three preceding crops. The positive correlation between protein in wheat and flour is represented graphically. The positive correlation between the ash content of wheat and flour was shown and the fact emphasized that flour ash as a criterion of grade must be considered in conjunction with the ash content of the wheat. The relation between moisture in wheat before and after tempering and moisture in flour is also shown.

The milling and baking qualities of a dead wheat, C. O. Swanson (*Northwest. Miller, 146 (1926), No. 2, p. 154*).—A study of the milling and baking qualities of flour produced from dead wheat about 25 years old was made at the Kansas Experiment Station. The wheat was dark red with plump, apparently normal kernels, and after cleaning tested 56.3 lbs. per bushel.

The milling test did not show that the wheat was much different from normal wheat, and similar amounts of tempering water were required to condition the wheat as normally used on Kansas hard winter wheat. In this old wheat the water was not as strongly absorbed as in ordinary wheat and hence more evaporated during the milling process. The ash content showed that the

bran coat was more brittle than in normal wheat and was not sufficiently toughened by the tempering water.

Baking results in comparison with a flour milled from the 1925 crop indicated a very low value for color and texture. The texture was very heavy and soggy, and there was no oven spring whatever in the flour. The behavior of this flour in baking and the properties of the baked bread resembled that obtained with wheat injured by heating or by excessive germination. This also held for the gluten washed from this flour.

Does dead wheat make good flour? C. O. Swanson (*Amer. Miller, 54 (1926), No. 4, p. 380*).—Essentially noted above.

The milling and baking qualities of wheat 25 years old, C. O. Swanson (*Jour. Amer. Soc. Agron., 18 (1926), No. 4, pp. 367, 368*).—Essentially noted above.

Proceedings of the International Seed Testing Association (*Internatl. Rev. Sci. and Pract. Agr. [Rome], n. ser., 3 (1925), No. 4, pp. 1095–1181, figs. 3; 4 (1926), No. 1, pp. 150–164, figs. 6*).—These pages include the following papers: Contribution to a Monograph on the Determination of the Country of Origin of Clover and Forage Crop Seed, by G. Gentner; The Place of Origin of Seeds, by L. François; Investigation in Regard to Weed Seeds Found Among the Seeds of Argentina with Reference to Their Origin and Distribution in the Producing Districts of Argentina, by W. von Petery; Seed Injury from Fungi and Insects, by L. C. Doyer; and The Distinction Between Seeds of Italian Rye-Grass and Perennial Rye-Grass and Between Seeds of Rye-Grass and Meadow Fescue, by E. Hellbo.

Official Seed Testing Station for England and Wales—eighth annual report [1925], A. Eastham (*Jour. Natl. Inst. Agr. Bot., No. 5 (1926), pp. 9–21, fig. 1*).—The average purity and germination are tabulated and discussed for 21,894 samples of agricultural seed received from various sources in England and Wales during the year ended July 31, 1925.

Common weeds of Colorado lawns, L. W. Durrell (*Colorado Sta. Bul. 310 (1926), pp. 8, figs. 5*).—Common weeds in Colorado lawns, including mouse-ear chickweed, crab-grass, broad-leaved and buckhorn plantain, sheep sorrel, and dandelion (E. S. R., 39, p. 37) are described and control methods outlined. Suggestions are given for starting a weed-free lawn and on the use of sprays in killing lawn weeds.

Effect of weeds upon crop production (*Iowa Sta. Rpt. 1925, p. 39*).—In a study of the root system of Canada thistle, chemical analyses made frequently throughout the year showed that the least stored food is present just before blooming and the largest amount in December. The roots absorb from the soil even when the ground is frozen. Certain rhizomes were as long as 3 ft. and roots have been found to penetrate to about 7 ft. deep.

HORTICULTURE

[Horticultural investigations at the Hawaii Station, 1925], W. T. Pope (*Hawaii Sta. Rpt. 1925, pp. 3–9, 17, 18, figs. 4*).—In conformity with the preceding report (E. S. R., 54, p. 136), there are presented brief notes on the progress of various studies.

Of three methods of propagating avocados, namely, whip and side-tongue grafting and shield budding, the whip graft method, in which very young growth was utilized, proved most satisfactory. Over 60 per cent of success was obtained with the Macdonald variety. The side-tongue graft was found more successful for seedling avocado stocks over six months of age and for mangoes. Propagation studies with breadfruit, in which cuttings of the sur-

face roots were used, proved to be a successful but a rather slow and difficult process. Litchi was propagated by air layering. Observations upon rootstocks showed marked differences in vigor and grafting congeniality in various lots, indicating the advisability of using selected material.

Among plants imported during the year were numerous varieties of breadfruit, grapes, bananas, mangoes, avocados, and citrus.

H. F. Willey of the Haleakala Substation reports upon the results of numerous variety tests with vegetables and fruits.

[Horticultural investigations at the Iowa Station] (*Iowa Sta. Rpt. 1925, pp. 38, 48–51, 52, 58–60*).—Considerable progress was recorded during the year upon various investigations (E. S. R., 53, p. 741). Colorimeter measurements of the amount of malachite green absorbed by ground apple twigs of different varieties from solution showed a well-defined varietal alignment correlated with hardiness. In general the hardier varieties removed the greater amount of dye from solution.

Of various ornamental evergreens tested for hardiness, the junipers, with the exception of the Irish and Swedish forms were found satisfactory. The Japanese yew was also hardy, but arbor vitae suffered unless planted in moist soil or given a thorough watering just before freezing.

Cold storage studies with Grimes apples are again reviewed (E. S. R., 55, p. 239). Tests with Jonathan apples gathered from trees of different ages and from different cultural plats showed that these factors are less important in determining keeping quality than the time of storing and the character of the storage. That variability in the length of apple fruit spurs is essential to annual production was indicated in studies in a Wealthy orchard in Charles City. While control trees made uniform length growth and were distinctly biennial in habit, those subjected to a combination of pruning and fertilization made variable growths and were inclined to annual fruiting. Successful pruning consisted in making small cuts on terminals and lateral branches rather than severe treatments. The maturity of sweet corn designed for seed purposes was not materially hastened by topping the plants. The opening of the husks, however, did accelerate drying of the kernels.

In apple breeding studies Jonathan proved to be one of the best parents used. It was found, however, that this variety must be crossed with more vigorous kinds in order to gain increased vigor for the progeny. Jonathan proved heterozygous for size and form of fruit, flesh texture, flavor, and season and had a tendency to impart red color to the seedlings. The parental combination, Jonathan × Salome, yielded several promising seedlings, two of which, designated as Edgewood and Secor, are deemed desirable red winter apples. Observations upon an orchard of fourth generation seedlings of Hill Chili peach showed a number of promising trees, hardier than the usual standard varieties.

The results of the completed orchard humus project showed that apple trees grown continuously in clover sod gave the highest yields. Those on clean cultivated and cover-crop plats suffered severe injury, while trees on blue-grass sod lacked in general vigor and fruitfulness. Exposure to full sunlight was decidedly beneficial to the trees. In general, a correlation existed between circumference, terminal fruit buds, leaf growth, and production. The application of nitrate of soda restored impoverished blue-grass trees to a first-class fruiting condition.

The chemical examination of fruit spurs from the several plats showed high and low production to be associated, respectively, with a low and high ratio of nitrogen to carbohydrates, the latter being quite constant in all cases. The growth of trees was visibly affected by the available nitrates in the soil.

A slight correlation was found between the nitrogen content of the soil and the total nitrogen content of the twigs and leaves. Soil nitrate content varied during the growing season, and a correlation was noted between yield and treatment of the plats and their average nitrate content.

[**Horticultural investigations at the Mississippi Station**], J. C. C. PRICE and C. B. ANDERS (*Mississippi Sta. Rpt. 1924, pp. 18–20, 35, 36*).—Observations upon peach trees grown from nursery stock of different ages and grades showed June buds in the various grades to give better success than 1-year-old trees of any grade. Medium sized 1-year-old trees gave better results than did larger stock. June buds cost less and are deemed in every way more satisfactory than older trees. Among pecan varieties, Schley led in quality and percentage of kernel, with Success second. Stuart, however, is deemed the most satisfactory variety. The summer pruning of muscadine grapes resulted in new shoots which carried a light crop of fruit maturing about one month later than the main crop. Livingston Perfection proved the most satisfactory tomato in a variety test, and pruning increased the number and quality of the fruits.

Work at the Raymond Substation indicated that nitrate of soda is a more valuable fertilizer for garden peas than ammonium sulfate or a combination of nitrate of soda, ammonium sulfate, cottonseed meal, and tankage. The best yields of peas were obtained with an application of 1,000 lbs. per acre of a 8–4–3 formula. With garden beans the 8–4–3 formula with nitrogen from nitrate of soda proved best.

High altitude vegetable growing: Lettuce, cauliflower, peas, R. A. MCGINTY (*Colorado Sta. Bul. 309 (1926), pp. 3–34, fig 10*).—Stating that vegetable growing in Colorado has greatly expanded in recent years, due to developments in the high mountain valley regions, the author discusses the growing and handling of lettuce, cauliflower, and peas under high-altitude conditions. Tabulated results of a lettuce fertilizer test conducted in 1925 show the favorable effect of commercial fertilizers.

Vegetable seed production in Idaho, C. C. VINCENT and L. E. LONGLEY (*Idaho Sta. Bul. 140 (1925), pp. 27, figs. 10*).—Dividing vegetables into biennial and annual groups according to the time required to reach seed-producing age, the authors discuss the culture and handling of a number of important vegetable seed crops which experience has shown may be successfully grown in Idaho. Among biennials, turnips, parsnips, and salsify, being hardy, are left in the ground over winter, while beets, carrots, and cabbage are best wintered over in pits. Data on the amount of seed produced from small, medium, and large-sized onion bulbs of the Red Wetherfield variety showed the highest yield of seed from the largest bulbs. Based on records taken over a series of years, it is shown that the average yield per acre of sugar beets, carrots, cabbage, corn, pumpkins, and radish in Idaho is well above the average in the United States as a whole.

Celery culture in Michigan, J. B. EDMOND (*Michigan Sta. Spec. Bul. 157 (1926), pp. 3–14, figs. 3*).—This, a revised edition of an earlier noted publication (E. S. R., 29, p. 145), contains general information on planting, culture, blanching, protection from various pests, and varieties.

Results of sweet-corn suckering experiments, H. C. THOMPSON (*New York Cornell Sta. Bul. 450 (1926), pp. 15, figs. 3*).—Although in only one instance, that of suckers removed from Stowell Evergreen plants at the time of tasselling, was there found a statistically significant loss in yield of marketable ears due to suckering, the actual yields of the treated plants in both Golden Bantam and Stowell Evergreen were lower in all cases than those of the controls. In

respect to time of maturity, there was no consistent nor statistically significant advantage in earliness due to the removal of the suckers. Relative to the size of the ear, the experiments failed to show any definite advantage from suckering. An average of five years' records showed a slight gain in ear size in Golden Bantam from early and from continued suckering and a slight loss from late suckering. In Stowell Evergreen there was found a slight gain from continued suckering and a loss from early and late suckering. In only one instance, that of continued suckering in the Golden Bantam variety, was the gain in ear size statistically significant. In respect to the amount of stover, the suckering treatment reduced Golden Bantam yield from 9,525 lbs. per acre for no treatment to 6,502 lbs. in the case of late-suckered plants, and in Stowell Evergreen from 10,873 lbs. for controls to 9,211 lbs. for late-suckered plants. In conclusion, the author points out that, under the conditions obtaining in the studies, suckering was not a profitable operation and can not, therefore, be recommended as a general commercial practice.

Apple physiology: Growth, composition, and fruiting responses in apple trees, R. H. Roberts (*Wisconsin Sta. Research Bul. 68 (1926), pp. 72, figs. 36*).—Studies conducted with dwarf apple trees under controlled greenhouse conditions and with standard trees growing in the open, so treated with respect to nitrogen as to induce widely different growth responses showed the most abundant blossom-bud formation on those trees making an intermediate amount of growth and whose shoots and spurs were found to contain an intermediate ratio between carbohydrates and nitrogen, thus bearing out the results obtained with the tomato by Kraus and Kraybill (E. S. R., 40, p. 40). Fruitfulness in the several branches of a single tree frequently varied as much as between the branches of separate trees, and was apparently correlated with the type and composition of the shoots. Very slender growth in a variety normally bearing sturdy shoots was found to be an indication of low fruitfulness. Such shoots were found high in nitrogen and low in carbohydrates. Blossom-bud formation was apparently closely associated with secondary thickening due to carbohydrate accumulation. Large tip leaves accompanying this secondary thickening were, in the case of McIntosh, a positive indication of fruitfulness.

H-ion and oxidase tests of shoots and of different portions of a single shoot frequently showed greater differences within a single shoot than between separate ones. Catalase tests indicated a lack of direct correlation between this reaction and blossom-bud formation. Examination showed that blossoms on strongly vegetative growths are not only fertilized more quickly than those on weakly vegetative growths, but also contain more ovules per blossom and seed per mature fruit. In the Wealthy, self-sterility was found to be due to a slow rate of pollen-tube growth rather than the inhibition of tube growth. The irregularity with which buds burst into growth in the spring is deemed to be associated with their previous season's development rather than with inhibitors. The results of the study suggest that fruitfulness and vegetation are not opposing functions in the apple tree, and that the blossom and the fruit are simply vegetative structures.

Physical and chemical characteristics of maturing apples as related to time of harvest, J. R. Neller and F. L. Overley (*Washington Col. Sta. Bul. 205 (1926), pp. 5–38, figs. 12*).—Observations upon the keeping quality and chemical changes in common and cold storage of Delicious and Jonathan apples harvested in advance of, during, and subsequent to the time of commercial picking indicated that commercial apples are frequently harvested before reaching their best condition. Analyses showed increases of 182 and 80 per cent

in sucrose content for Delicious and Jonathan apples, respectively, during the six weeks of the experimental harvesting period. At the same time there was a marked decrease in the starch content of Delicious and the acid content of Jonathan. During the first five weeks of cold storage the Delicious and Jonathan increased 22 and 32 per cent in weight, respectively, making the actual sugar gain considerably greater than shown above. Pressure test readings showed that Delicious apples continued to harden on the trees up to the best harvest date, October 7. Jonathan apples, on the other hand, attained their maximum hardness, about 23.5 lbs., on September 14. The readings gradually decreased in storage, reaching in the case of Jonathan about 14 lbs. at the end of 20 weeks, at which time the apples were in prime eating condition. Jonathan apples reached their best picking condition on September 23, when the acid content was 0.57 per cent, and the hardness 23.5 lbs.

Early harvesting was prompted by the dropping of fruit. Computations showed that, in the case of Jonathan, dropping loss was more than offset by the increase in size of the fruit up to the optimum stage for harvesting, while in Delicious the dropping loss exceeded possible gains. Formulas for correlating the data of the physical and chemical characteristics of the apples are offered to assist in making value comparisons of apples harvested at different dates, stored in different ways, and grown under different cultural conditions. The authors suggest that determinations of hardness and starch for Delicious and hardness and acid for Jonathan may be useful in estimating the best harvesting dates for these varieties.

The ripening, storage, and handling of apples, J. R. MAGNESS ET AL. (*U. S. Dept. Agr. Bul. 1406 (1926), pp. 64, pl. 1, figs. 30*).—This bulletin is presented in three parts, the first of which, entitled Studies of the Ripening of Apples, by all the authors (pp. 1–24), presents data obtained in widely separated parts of the country upon the ripening of fruits of a number of standard varieties. Of many characteristics studied, adherence of the fruit to the spur, changes in ground color, and changes in firmness of flesh were found the most reliable indexes to approaching ripeness. Apples increased in size as long as they were attached to the tree. Varietal differences in respect to changes in seed color were so marked as to render this character an unsatisfactory index to maturity. Records showed that there was a fairly definite length of time necessary to bring varieties to prime picking condition, and that this period was closely associated with the distribution of varieties.

Part 2, entitled The Ripening of Apples in Storage as Influenced by Temperature, by the first three authors (pp. 25–50), discusses, for the greater part, results obtained in the cold storage plant and laboratories at Arlington, Va. It was found that the rate of ripening after picking is almost entirely dependent upon temperature, and that varieties differed sharply in their softening rates at any given temperature. At 40, 50, and 70° F. softening proceeded approximately twice as fast as at 32, 40, and 50°, respectively. An analysis of apples held at different storage temperatures showed a slight increase in sugar in all varieties between the time of picking and when the fruit was fully mature. No consistent variation was noted in the quantity of either total or reducing sugar depending upon the temperature at which the fruit was held while ripening. Acidity decreased between the time of picking and that of full maturity in all varieties and at all temperatures. In general a close agreement was noted between the rates of respiration and softening in apples. The respiratory ratio was practically always slightly more than 1, the ratio for the complete oxidation of dextrose, and less than 1.33, the ratio for the complete oxidation of malic acid.

Part 3, entitled The Handling of Apples for Storage, by the first three authors (pp. 51–63), contains practical suggestions on the time of picking and methods of handling apples designed for storage. In general, late-ripening varieties are required for common, air-cooled storage, and, with the exception of Jonathan, grown under long-season growing conditions, picking should be delayed as long as the fruit is holding well and injury of freezing is not imminent. Late picking usually results in a firmer and higher quality fruit. If possible fruit should be allowed to cool before placing in the storage chamber. A reduction of 2 to 4° below outdoor temperature will favorably affect the keeping quality of fruit. In artificial storage the fruit should be cooled as quickly as possible to 30–32°, maintaining at the same time a relative humidity of 85 per cent.

The pruning of trees and shrubs, W. DALLIMORE (*London: Dulau & Co., 1925, pp. 92, pls. 8*).—This handbook contains information based on practices in the Royal Botanic Gardens, at Kew, upon pruning trees and shrubs, with special reference to proper methods of treating wounds.

FORESTRY

Forestry almanac (*Washington: Amer. Tree Assoc., 1926, semicent. ed., pp. XIII+348, figs. 19*).—A special edition of a previously noted work (E. S. R., 52, p. 241).

Forest fires and weather, A. E. MOSS (*Jour. Forestry, 24 (1926), No. 5, pp. 555–558, figs. 2*).—In correlating the frequency and the area of surface fires with records of weather for the same days, the author found that in hardwood stands relative humidity is a potent factor. Based on records for the years 1922–1924, a median table in which the area of a fire burning more than one day was proportioned over the entire period of the fire gives for humidities of 90, 80, 70, 60, 50, and 45 per cent area figures of 3, 5, 7, 10, 15, and 20. The humidity of the day preceding a fire had an even greater effect than that of the current day.

Precipitation and forest fires in northern Minnesota, J. A. MITCHELL (*Jour. Forestry, 24 (1926), No. 5, pp. 507–510, figs. 4*).—An analysis of precipitation and forest fire data recorded for northern Minnesota during the period 1915 to 1923 showed that the fire preventing effectiveness of moderate rainfall is least in summer and greatest in autumn. Spring rains were intermediate, corresponding closely to the average of the entire season.

Development of industrial forestry, R. M. M. (*Commerce Mo., 8 (1926), No. 3, pp. 23–30*).—A general discussion of the forestry situation in the United States, with special reference to commercial developments.

Third report on a forest survey of Illinois, C. J. TELFORD (*Ill. Nat. Hist. Survey Bul., 16 (1926), Art. 1, pp. IV+102, pls. 6, figs. 14*).—This, the third report (E. S. R., 52, p. 843) in a series relating to the forests of Illinois, presents information upon the area, condition, and distribution of the forests and forest land of Illinois, with notes on the productiveness, in terms of forest crops, of the common soil types.

Forestry in British Honduras, S. J. RECORD (*Jour. Forestry, 24 (1926), No. 5, pp. 562–568*).—A brief discussion of the forestry situation in British Honduras, where the newly organized Forest Service is attempting to regulate the hitherto uncontrolled lumber industry. Mahogany, which is annually cut to the extent of approximately 10,000,000 bd. ft., is the most valuable species, and will be conserved under the new régime.

Reports on certain forest areas of Tavoy and Mergui Districts inspected from the ground as a preliminary to the aerial stockmapping of these districts, 1924–1925, C. W. Scott and C. R. Robbins (*Burma Forest Bul. 14 (1925), pp. II+42, pl. 1*).—This report comprises brief notes on the nature, composition, and distribution of the forests.

The native plants of our forests, O. Feucht (*Die Bodenpflanzen Unserer Wälder. Stuttgart: Strecker & Schröder, 1925, pp. VII+123, pls. 8, figs. 48*).—This little handbook presents descriptive notes on ground plants found in the German forests.

Common trees, J. F. MacBride (*Field Mus. Nat. Hist. [Chicago], Dept. Bot. Leaflet 11 (1925), pp. 44, pls. 2, figs. 43*).—This leaflet contains excellent photographic illustrations of the flowers, leaves, and fruits of 25 well-known North American trees.

Platylophus trifoliatus D. Don: A contribution to its ecology, J. F. V. Phillips (*So. African Jour. Sci., 22 (1925), pp. 144–160*).—An account of the distribution, associated species, botanical characteristics, and soil, temperature, and moisture requirements of the tree.

Historical sketch of the redwood industry, W. W. Fairbanks (*Timberman, 27 (1926), No. 8, pp. 38–41, 168, figs. 10*).—A popular account dealing with the early development of the redwood industry.

Timbers from Nigeria (*Bul. Imp. Inst. [London], 24 (1926), No. 1, pp. 1–8*).—Herein are presented data on the mechanical properties and working qualities of five important Nigerian woods, locally known as abura, afara, oro, arere, and ogia.

The industrial qualities of the woods of colonial Africa [trans. title], J. Meniaud and F. Bretonnet (*Bul. Agence Gén. Colon. [France], 19 (1926), No. 212, pp. 163–188, figs. 2*).—As assistance to importers of timber from the French colonies of western Africa, there are presented data on the weight and color of the wood of various species, the present and potential possibilities of exploitation, dimensions, and possible uses, with notes concerning the resemblances of various woods to well-known European and American species.

Industrial outlets for short-length softwood yard lumber, E. M. Davis (*U. S. Dept. Agr., Dept. Circ. 393 (1926), pp. 60, figs. 11*).—Emphasizing the fact that there is at the present time a very considerable loss from the wasteful use of lumber less than 8 ft. in length, the Forest Products Laboratory herein presents the results of an extended survey of industrial and factory uses for short-length softwood lumber, giving in detail the amount, kinds, and sizes of lumber used in manufacturing various articles. It was found that, as a rule, short-length lumber brought a better price in the industries than in building operations.

DISEASES OF PLANTS

Diseases of crop-plants in the Lesser Antilles, W. Nowell (*London: West India Com., [1923], pp. XIX+383, [pls. 75], figs. [51]; rev. in Jour. Gold Coast Agr. and Com. Soc., 3 (1924), No. 2, pp. 94–97*).—This work was prepared as a handbook to the diseases affecting crop plants in the Lesser Antilles, the immediate aim being to provide for the agricultural officer and the planter a means of reference to the present state of knowledge respecting specific diseases, as well as a local textbook of the subject in the West Indian Agricultural College. Certain diseases have been included which have not occurred in these islands, but are of interest in view of the possibility of their appearance or recognition in the future.

The work is in two main parts. Of the first part, one section deals with disease causation (8 chapters) and another with prevention and control (6 chapters). Of the second part, a first section deals (in 2 chapters) with general diseases (root, stem, and leaf), a second section (6 chapters) with diseases of permanent crops (cacao, coconut, citrus plants, coffee, rubber, and minor fruit trees), and a third section (8 chapters) with diseases of arable crops (banana, corn and sorghums, cotton, sugar cane, root crops, leguminous plants, minor fruit plants, and unclassified plants). Somewhat liberal references are indicated, and a short glossary of West Indian terms is provided.

Plant pathology (*Iowa Sta. Rpt. 1925, pp. 35–38*).—Iacope, a strain of Copenhagen Market cabbage said to be quite resistant to cabbage yellows as noted on page 545, while not entirely resistant to yellows, produced more than 70 per cent heads on land that was severely infested. On less severely infested land 90 per cent of the plants matured heads.

A bacterial leaf spot of corn and sorghum is described as having been found on a number of varieties of corn, sorghum, Sudan grass, Johnson grass, and pearl millet. The common millets and various grasses did not become infected under favorable greenhouse conditions. Experiments are said to indicate that the organism is seed borne on sorghum, and it is suggested that the disease may winter over in this manner. It is claimed that the disease is checked by dry weather but spreads rapidly in the field during wet weather.

A study of crown gall of root-grafted apple trees in the nursery is said to have shown that only a small percentage of the overgrowths are caused by the crown gall organism, *Bacterium tumefaciens*, the others being due to an excess formation of callus.

Evidence was secured that is said to indicate that corn rust is carried from *Oxalis* spp. to corn, and that the initial infection does not come from overwintering uredospores of the rust.

The downy mildew of alfalfa is said to be serious some seasons in Iowa, and inoculation experiments on alfalfa, clover, peas, etc., showed that *Peronospora trifoliorum* is limited in its attack to *Medicago sativa* and *M. lupulina*. The fungus forms oospores in the leaves in the fall and thus winters over. No evidence was found indicating the occurrence of a perennial mycelium in the host plant.

Annual report of plant pathology department, D. C. NEAL (*Mississippi Sta. Rpt. 1924, pp. 28–31*).—Progress reports are given of investigations continued from the previous year (E. S. R., 52, p. 242).

In the test of tomatoes resistant to *Fusarium lycopersici*, nine varieties and strains were tested and information secured on their resistance to disease, productivity, fruit characters, etc. In cooperation with the State Plant Board 50 lbs. of wilt-resistant tomato seed was produced for general testing throughout the State.

Some beneficial effect is reported on the control of nematode root knot of peach trees through the application to the plats of inoculated sulfur at the rates of from 500 to 2,000 lbs. per acre. However, the author states that additional data must be secured before definite conclusions can be drawn from the experiments.

Additional work on the study of the anthracnose (*Colletotrichum trifolii*) of red clover and alfalfa is briefly reported. Twenty-three varieties and strains of alfalfa were tested as to resistance to the disease, and 9 showed good resistance, 7 fair, and 7 poor. An anthracnose of Hubam clover was found to be due to a species of Colletotrichum, and studies are in progress to determine whether the organism causing the disease is identical with that which causes anthracnose of alfalfa and red clover.

[Plant disease investigations], H. L. Bolley (*North Dakota Sta. Bul. 194 (1926), pp. 40–50, pl. 1, fig. 1*).—Experiments in the production of potatoes from seed secured in seed bolls are said to indicate that some of the deterioration diseases, such as leaf curl, curly dwarf, and possibly mosaic, may be transmitted from seed to the seedling.

Calcium cyanamide applied at the rate of from 100 to 250 lbs. per acre to flax-sick, wheat-sick, and potato-sick soils is said to have produced a noticeable influence on the growth of the crops.

By crossing and selection, resistance to rust and wilt of flax is said to have been increased, and some improved strains have been secured in which there was an accumulation and transmission of factors for resistance.

Investigations by C. I. Nelson and M. Dworak on the specificity of constituents as a factor of resistance of plants to disease have yielded characteristic globulins from wilt-susceptible and wilt-resistant flax that are immunochemically different from each other, indicating a difference in the protein constituents. Using the globulins in media inoculated with *Fusarium lini*, no differences were observed in the growth of the fungus, although animals reacted differently to the different globulins.

Studies by W. Weniger, covering a period of four years, have shown that stem-end browning of potato tubers in North Dakota may be due to the organism causing wilt (*F. oxysporum longius*), the bacterium of blackleg, the two organisms acting together, or to a nonparasitic discoloration. With the varieties Rural New Yorker and Irish Cobbler the discoloration is less common than on Early Ohio, and it was found more generally to be caused by the blackleg organism and by nonparasitic causes than by the Fusarium wilt organism.

The same experimenter found in her study of the black point disease of wheat that certain of the organic mercury compounds now on the market will materially decrease the internal infection of the diseased grains, and their use stimulated germination over the nontreated seed. The fungus most commonly isolated from black point wheat grains was *Helminthosporium sativum*. The same fungus was found to cause a disease of wheat roots and a blighting of the leaf blades and glumes of wheat.

Some data are given on ergot in wheat, a more detailed account of the studies having been noted previously (E. S. R., 51, p. 848).

Experiments on the control of stinking smut and loose smut of wheat through seed treatment are said to indicate that some of the organic mercury compounds controlled stinking smut when used in solution, but the organic mercury dusts did not control this smut. Copper carbonate was efficient in controlling bunt and gave yields equal to the formaldehyde treated seed lots. For loose smut the uspulun cold treatment gave some control but not sufficient to warrant its further recommendation.

The important plant diseases observed during the period covered by the report are enumerated.

Report of work done in the mycological section during 1923–24, M. K. Venkata Rao (*Mysore Dept. Agr. Rpt. 1923–24, pt. 2, pp. 7–10*).—The mycologist's report, crediting M. J. Narasimhan with control, states that areca koleroga was very severe, owing to the heavy monsoon rainfall. The Phytophthora appeared earlier on sandal and on Bryophyllum than an areca. The coffee black rot organism, *Corticium* sp., attacks bamboo and two ferns, *Niphobolus fissus* and *Pleopeltis linearis*, both observed to grow as saprophytes on old coffee plants. Studies were carried out on the Corticiums affecting *Gardenia gummifera* and *Canthium parviflorum*, and cross inoculations were attempted, with partial success. Apple leaves were observed to be dropping

on account of attack by *Alternaria* sp. The trees were sprayed with 5-5-50 Bordeaux mixture and were thereby restored to good condition. Banana developed symptoms of Thielaviopsis attack, but yielded no fungus. An inoculated plant gave rise to a sucker which showed the disease and demonstrated one way in which the disease spreads. Disinfection with 1 per cent Bordeaux mixture is advised. Mango low yield was found to be due to the fact that about 40 per cent of the blooms are male only, the other 60 per cent being bisexual and potentially fruit bearing.

Notes on species of Fusarium and Sclerotium in Uganda, W. SMALL (*Roy. Bot. Gard. Kew, Bul. Misc. Inform. No. 3 (1925), pp. 118–126*).—The author gives an account of studies on *F. udum* as causing a potato rot in Uganda, also of *S. bataticola* and *F. udum* as together associated with a wilt or foot rot of beans, with taxonomic notes. It is mentioned that both the potato strain and the bean strain of *F. udum* have been proved to cause a rot of wounded potatoes, but it is concluded that neither strain of this Fusarium is actively pathogenic under natural conditions. The fungus is evidently widespread in the region in question. Its pathogenicity is supposed to depend less on the particular strain of the fungus than on the environmental conditions of its contacts with its host.

The leaf blight, Monilia foliicola, in the light of biological observations and investigations [trans. title], W. SIEMASZKO (*Acta Soc. Bot. Polon., 2 (1924), No. 2, pp. 81–98, pl. 1*).—Leaf blights similar to that caused by *M. foliicola* are said to have been found by Woronich on different hosts named at points indicated during 1912–1922. The present author's observations are added regarding locations, elevations, and conditions as to the occurrence of the fungus here discussed, which is also dealt with in regard to its biological behavior and systematic position. The author places the fungus provisionally under Moniliopsis, with the name *Moniliopsis foliicola*. A Latin description of the fungus is given.

Concerning the characters of certain fungi as exhibited by their growth in the presence of other fungi, C. L. PORTER (*Amer. Jour. Bot., 11 (1924), No. 3, pp. 168–188, pls. 3, figs. 9*).—The inhibitions exhibited by fungi may be grouped into five classes. Helminthosporium was inhibited chemically in a manner that may be regarded as typical. The inhibiting capabilities of a fungus may aid in identifying species, though richer media show less marked inhibitions than poorer. Inhibitions vary but slightly with amount of inoculum, time of inoculation, or depth of media. Products formed during growth often cause inhibition. Flax seedlings were measurably protected from Fusarium, which could only with difficulty pass a layer of earth heavily infected with the inhibitor. Roots of seedlings and root hairs gave no tropic response in the presence of fungi.

Tests of plant protectives, 1921–1922 and 1923 [trans. title], E. RIEHM (*Mitt. Biol. Reichsanst. Land u. Forstw. Nos. 24 (1923), pp. 104; 26 (1925), pp. 88*).—These reports in continuance of the work previously noted (E. S. R., 49, p. 540) list 657 and 426 titles, respectively.

Lime sulphur injury, J. S. SHOEMAKER (*Sci. Agr., 4 (1924), No. 6, pp. 180–184*).—Observation and experience during recent years have shown that among the factors correlated with lime sulfur destruction of chlorophyll and probably conducive thereto are conditions eventuating in a thin epidermis, reduction of pubescence, loose internal structure, presence of nascent oxygen, strong sunlight giving abundant actinic rays and heat, and subsequent killing and oxidation of the tissues. The trouble first shows, by microscopical examination, on the under side of the leaf, as a slight russeting. The injurious material evidently enters through the stomata, where the browning starts. Ultraviolet

rays may also be absorbed by the leaf chlorophyll and cause injury. Contributions from others are freely cited in connection with facts outlined.

It is believed that it is the very fine sulfur particles present in lime sulfur that are concerned in lime-sulfur injury. Sometimes their behavior in some respects is comparable to that of a gas, at other times to that of an acid. The increase of fungicidal and insecticidal properties are correlated with the conditions of injury to the plant. At times, the various factors, beneficial or prejudicial, act together, at other times separately.

It is claimed, however, that in any event the injury is to be regarded as a comparatively minor matter as contrasted with the benefits.

Sprays and sprayers [trans. title] (*Verslag. en Meded. Plantenziektenkund. Dienst Wageningen, No. 33 (1924), pp. 31, pls. 5*).—Sprays, sprayers, and appropriate practice are dealt with in systematic detail.

Co-operative experiments with copper carbonate dust and other substances for smut control in 1923, W. P. Fraser and P. M. Simmonds (*Sci. Agr., 4 (1924), No. 9, pp. 257–263*).—Apparently following up work previously noted (E. S. R., 54, p. 147), the authors carried out extensive experiments with several substances for control of bunt in wheat and of smut in Liberty hull-less oats.

Applications and method included formaldehyde 1–320, seed dipped 5 minutes, covered 1 hour; copper-carbonate dust (copper equivalent 18 per cent) thoroughly coating seed; Semesan, seed in 25 per cent solution 1 hour, then dried; copper sulfate (monohydrated) and calcium carbonate, equal parts, same rate and method as carbonate dust; sulfur dust (superfine, 95 per cent passing a 200 mesh per inch screen), 6 oz. per bushel; and Chlorophol, 3 per cent, soaked 1 hour, then dried. The results as tabulated indicate that good results will be obtained with copper-carbonate dust under conditions prevalent in western Canada, though each kernel must be thoroughly covered, which conditions can be fulfilled only by the use of a machine. The dust should be used at 2 or 3 oz. per bushel, though germination is not impaired by larger proportions.

Monohydrated copper sulfate and calcium carbonate, in equal quantities in the form of a dust, also gave effective control of bunt in wheat.

Copper carbonate is the most effective treatment for hull-less oats. It does not injure the germination of the seed, and effectively controls smut. It should be applied with a machine at the rate of 3 or more ounces per bushel.

Sulfur did not always give effective control of bunt, but owing to its cheapness it seems worth further trial, as it may be of value where the seed is only slightly smutted.

Solutions of Semesan and Chlorophol gave good control, but the method of soaking is troublesome with large quantities of seed. The germination tests in soil indicate that these substances may be of value where the soil is infected with fungi. Further tests along this line are desirable.

The relation of common barberry bushes to the occurrence of black stem rust on wheat and other cereals in Ohio, J. W. Baringer (*Ohio Dept. Agr., Div. Plant Indus. Bul. 18 (1924), pp. 38, figs. 15*).—An account is given of the early occurrence and subsequent history of cereal black stem rust in Ohio in connection with barley, the cyclic development of *Puccinia graminis*, weather conditions, host relations and susceptibility, wild grass hosts, results of barberry eradication, and literature cited (37 titles).

Factors influencing infection of Hordeum sativum by Ustilago hordei, J. A. Faris (*Amer. Jour. Bot., 11 (1924), No. 3, pp. 189–214, pls. 2, figs. 7*).—The study here reported of environmental factors affecting degree of infection of *H. sativum* by *U. hordei* shows that high percentages of infection can

be obtained over wide ranges of soil temperature, acidity, and moisture lying well within those usually existing when barley is planted in the field. Apparently, the biological form of the smut used with a particular variety of barley is far more important than are the soil conditions. High percentages of infection were produced over a wide temperature range. Increase in moisture gave, in general, increase in infection in the two acid soils.

Smuts of wheat (*Egypt Min. Agr., Bot. Sect., Mycol. Div. Leaflet 5 (1924), pp. 5, pls. 6*).—Wheat stinking smut (*Tilletia tritici* and *T. levis*), loose smut (*Ustilago tritici*), and flag smut (*Urocystis tritici*) are dealt with as to causation, infection, diagnosis, and treatment.

The nematode disease of wheat (*Egypt Min. Agr., Bot. Sect., Mycol. Div. Leaflet 4 (1924), pp. 3, pls. 5*).—This leaflet deals briefly with the diseases of wheat caused by the nematode *Tylenchus tritici* as to diagnosis, causation, spread, control, and relation between the nematode disease and bacterial disease of wheat.

Cabbage yellows, caused by Fusarium conglutinans, in Iowa, I. E. MELHUS, A. T. ERWIN, and F. VAN HALTERN (*Iowa Sta. Bul. 235 (1926), pp. 185–216, figs. 10*).—A description is given of cabbage yellows caused by *F. conglutinans*, which is said to be widely distributed in Iowa, losses of from 50 to 95 per cent of the crop of commercial varieties having been reported. An account is given of the efforts made by the authors to produce a strain of Copenhagen Market, an early variety of cabbage, that should be resistant to yellows. A greenhouse method of selection for disease resistance and for seed stock propagation was worked out, and by this means a new strain, Iacope, was developed. The strain is said to resemble the parent variety, although it is somewhat less uniform in type and is somewhat later than the earliest strains of Copenhagen Market. It is said to be adapted to infested soils and produced marketable crops in 1924 and 1925. Continued selections through four generations in infested soil are reported to have increased the resistance to yellows.

Bacterium maculicolum [trans. title], C. FERDINANDSEN (*Nord. Jordbrugsforsk., 1923, No. 5–8, pp. 467–474*).—A comparative account is given of the organism associated with cauliflower spot disease, said to have been first described by McCulloch (E. S. R., 26, p. 54) as *B. maculicolum*.

Summary of investigations on clover rusts, W. H. DAVIS (*Mycologia, 16 (1924), No. 5, pp. 203–219, pl. 1, figs. 4.*)—The investigations here described were carried out on clover rusts as to the existence of only one or of several species of Uromyces on white, red, zigzag, or alsike clover; as to whether pycnial and aecial stages of Uromyces appear on red, alsike, and zigzag clover; as to what morphological differences exist in these three rusts; and as to whether inoculations within the host species and reciprocal inoculations with the different spore forms confirm or disprove the opinion regarding the species of Uromyces on these four species of Trifolium. The observed morphological differences are outlined.

White clover rust (*U. trifolii-repentis*) is found on white clover (*T. repens*), red clover rust (*U. trifolii*) on red clover (*T. pratense*) and on zigzag clover (*T. medium*), and alsike clover rust (*U. hybridi*) on alsike clover (*T. hybridum*). "Therefore, there is a separate species of Uromyces with all spore forms on each of these clovers, white, red, and alsike. The rust on alsike is not the same as on white clover but a separate species, *U. hybridi*."

Is the apparent winter-killing of sweet clover and red clover a result of disease injury? R. NEWTON and W. R. BROWN (*Sci. Agr., 5 (1924), No. 3, pp. 93–96, figs. 4*).—Description and statistics are given as resulting from study of a disease affecting white sweet clover (roots chiefly) and red clover (junction

of root and crown), the types of injury to these two clovers being quite distinct. The later sweet clover injury studies have confirmed the earlier, and this injury is found to be due to a Sclerotinia. Like studies on the red clover disease failed to establish the Sclerotinia as a primary cause, though it may be an important contributory factor in the red clover injury.

A corn disease, H. A. Dade (*Jour. Gold Coast Agr. and Com. Soc., 3 (1924), No. 2, pp. 84, 85*).—A maize disease proved, after examination in the mycological laboratory at Aburi, to be corn smut (*Ustilago zeae*).

A new Cercospora on Humulus, E. S. Salmon and H. Wormald (*Jour. Bot. [London], 61 (1923), No. 725, pp. 134–136*).—A account is given, with Latin description, of a Cercospora on leaves of *H. lupulus*. This fungus is considered a new species and is named *C. cantuariensis*. This fungus is claimed to be distinct from a Cercospora described by S. Hori in the Japanese language as *C. humuli*, a description of which, in English, was furnished by Hori to the author and is given in this paper. Along with this is a Latin description by the present author which is intended as a first publication of the species *C. humuli*.

The smuts of millet (*Egypt Min. Agr., Bot. Sect., Mycol. Div. Leaflet 6 (1924), pp. 4, pls. 5*).—Millet long smut (*Tolyposporium filiferum*), grain smut (*Sphacelotheca sorghi*), and head smut (*Ustilago reiliana*) are dealt with as to their recognition, history so far as known, and control measures.

Preliminary investigations on the root-rot and blight of canning peas, R. E. Stone (*Sci. Agr., 4 (1924), No. 8, pp. 239–241, figs. 2*).—In eastern sections of Ontario, especially in Prince Edward County, the root rot and blight has been a serious handicap for many years. Studies have shown that there are several organisms associated at times with the disease, including a Rhizoctonia, a Fusarium (*F. vasinfectum pisi?*), and a Pythium (*P. debaryanum?*).

During 1923 experiments were carried out with pea strains promising resistance. No strain was completely immune, and striking differences in susceptibility are noted. The resistant strains are said to be of types which are in demand by the canning industry.

A preliminary study of the relationship between manuring and susceptibility to disease in potatoes, H. W. Miles and B. Thomas (*Jour. Agr. Sci. [England], 15 (1925), No. 1, pp. 89–95*).—Evidence obtained from investigations pursued on the farm of the Kirton Agricultural Institute indicates that excessive nitrogen (in quantities not balanced by potash) in manures favors potato diseases. The capacity for disease resistance in plants varies directly with the quantity of potash in the fertilizer. For healthy growth, potassium sulfate and chloride are more efficient than are sylvinite and the lower grades of potash salts. The application of phosphates to potato crops on the silt soils of the Holland division of Lincolnshire tends to increase the susceptibility to disease. Heavy dressings of a well-balanced compound manure tend to increase the immunity of the crop to disease.

Some potato disease problems in British Columbia, J. W. Eastham (*Sci. Agr., 4 (1923), No. 3, pp. 89–94*).—Potato canker (*Chrysophlyctis endobiotica*) is said to have been first noticed by Schilbersky in Hungary in 1896, elsewhere in Europe later, in Newfoundland in 1909, and in eastern Canada about 1911, not far from the time of its appearance in Pennsylvania. Information is given briefly regarding potato scab (*Actinomyces (Oospora) scabies*), late blight (*Phytophthora infestans*), black scurf (*Corticium vagum solani*), wilt (*Fusarium* sp.), rots (*F. coeruleum* and *F. trichothecioides*), and leaf roll and mosaic ("virus" diseases).

A head disease of sugar cane [Mauritius] [trans. title], E. F. S. SHEPHERD (*Rev. Agr. Maurice, No. 15 (1924), pp. 146, 147*).—A disease affecting the head and young leaves of sugar cane in Mauritius is briefly noted. A scanting of water supply may be causal. Among the organisms known to obstruct vessels are *Colletotrichum falcatum* and a gumming bacterium.

Sugar cane diseases, Mauritius.—I, Red rot [trans. title], E. F. SHEPHERD (*Rev. Agr. Maurice, No. 13 (1924), pp. 59–61*).—The island of Mauritius has at present few sugar cane diseases. Among those of comparative importance is red rot (*Colletotrichum falcatum*), which is here briefly noted.

Sugar cane smut [Mauritius] [trans. title], E. F. S. SHEPHERD (*Rev. Agr. Maurice, No. 14 (1924), pp. 107, 108*).—Less destructive than sugar cane red rot, above noted, is smut (*Ustilago sacchari*). Cane varieties sensitive to smut are indicated.

Rare cases of mosaic disease in highly resistant varieties of sugar cane, P. A. YODER (*U. S. Dept. Agr., Dept. Circ. 392 (1926), pp. 8*).—Attention is called to the occurrence of mosaic on several varieties of sugar cane which have been previously considered highly resistant or immune. In the fall of 1924 a case of mosaic was observed in Uba cane, and a search through plats at the sugar-cane field station at Cairo, Ga., showed a number of other varieties slightly affected.

Because of the scant amount of infection and the lack of evidence of any serious stunting effect on these varieties, which were formerly thought to be immune, the author thinks they can still be considered immune so far as yields are concerned; but the fact that they are susceptible must be taken into consideration in distributions to noninfected localities and in programs of total elimination of mosaic by planting only these varieties. Because of the rareness of mosaic on these varieties, a roguing program should easily be effective in eliminating the disease.

The Sclerotinia disease of sunflowers and other plants, G. R. BISBY (*Sci. Agr., 4 (1924), No. 12, pp. 381–384, figs. 4*).—The fungus connected with a stem rot of sunflower and diseases of several other plants, kept under observation since 1920 and reported on in 1921 (E. S. R., 47, p. 354), continues to be important in Manitoba, being especially common on sunflowers planted in gardens or on areas where certain common vegetables have been grown. From studies here outlined it is thought probable that this fungus is *S. sclerotiorum*. It may attack also alfalfa and clover, and it is thought that it may be identical with *S. trifoliorum* on those plants.

Tobacco diseases in Deli and vegetation of fallow tobacco land [trans. title], B. T. PALM and S. C. J. JOCHEMS (*Bul. Deli Proefsta. Medan, No. 20, (1924), pp. 69, pls. 15*).—The present article condenses what is at present known regarding the principal diseases of tobacco in Deli, namely, slime disease, mosaic disease, and Phytophthora disease, with the literature on each disease covering approximately the years 1893 to 1924.

The brown root rot of tobacco and other plants, J. JOHNSON, C. M. SLAGG, and H. F. MURWIN (*U. S. Dept. Agr. Bul. 1410 (1926), pp. 30, figs. 20*).—Brown root rot is a name adopted by the authors to designate a condition of the roots of tobacco and other plants characterized by a brown discoloration and decay of the root system, resulting in a stunting of the affected plants. The disease is said to be especially common in the tobacco soils of the Connecticut Valley, and it also occurs to a serious extent in other tobacco-growing districts. In its behavior, with respect to soil sterilization, infection, dilution of soil, and relation to environmental conditions, the disease appears to be of parasitic

origin, but no causal organism has been demonstrated to be definitely associated with it. On the other hand, the behavior of brown root rot soils when exposed to desiccation and aeration is not favorable to a parasitic hypothesis, and the results of crop rotation experiments are said to indicate a crop relationship which is contradictory to an explanation based on parasitism. In addition to tobacco, several other crop plants may be affected, notably tomatoes, potatoes, and certain legumes.

In a crop rotation system with tobacco, certain crops apparently not affected at all or not seriously affected by brown root rot favor the development or persistence of disease in the soil, whereas the commonly affected plants, like tobacco, tomato, etc., seem to favor the disappearance of the disease from the soil.

Observations of the disease covering a period of several years and the experimental results reported in the bulletin are held to indicate a possible means of control by attention to the rotation or cropping system practiced.

Watermelon diseases and their control, O. C. Boyd (*Melon Distributors' Assoc. Proc. and Minutes, 10 (1924), pp. 61–65*).—Precautions or control measures against anthracnose, wilt, root knot, and stem-end rot, which usually cause the greatest losses to the melon crop, are mentioned and explained in somewhat the same order as that in which they may be expected to be required during the melon season.

Watermelon seed treatment before planting and control of watermelon anthracnose by spraying, O. Woodard (*Melon Distributors' Assoc. Proc. and Minutes, 10 (1924), pp. 69–71*).—Immersion of watermelon seed for 5 minutes in a 1–1,000 mercuric chloride solution will free the seed externally from anthracnose. If thoroughly washed no injury to germination will follow. The disease may, however, be present in the field before planting or may be brought in, as in supplying manure to the soil.

Methods employed in recording results of spraying and dusting experiments in apple orchards, W. H. Brittain (*Sci. Agr., 4 (1924), No. 5, pp. 141–151*).—This account shows briefly the gradual development during some years of the orchard protective system at present employed (against both insects and diseases) and now requiring only minor changes for dusting and spraying, with tabulation of a few typical experiments. The natural outbreak was not sufficiently severe in any year to furnish a very severe test. At face value, sprays gave somewhat better control than dusts. In the matter of scab control, lime sulfur with arsenate of lime yielded, in 1920–1922, the highest percentage of clean apples. As regards freedom from all injuries (including insect work), the lime-sulfur plats appeared better than the Bordeaux plat.

Apple blotch in Indiana, M. W. Gardner (*Ind. Hort. Soc. Trans., 1923, pp. 70–80, figs. 6*).—The variety Delicious appears to be immune to apple blotch. Susceptible varieties are indicated. The fungus is locally perennial in the cankers, which form the main source of infection, and this may attack at almost any point, spores being spread during rains. Long distance spread occurs through nursery stock and seedlings. The disease is limited in Indiana by low temperatures and a short growing season. A petal-fall spray seems to be necessary to prevention. Lower concentrations of Bordeaux mixture have given good control in badly cankered trees. Lime sulfur is somewhat less reliable. A cumulative effect is obtained where sprays are applied each year.

Some studies on a Japanese apple canker and its causal fungus, Valsa mali, K. Togashi (*Jour. Col. Agr., Hokkaido Imp. Univ., 12 (1924), No. 3, pp. 265–324, pls. 4*).—Many apple trees in Hokushu and the northern provinces of

Japan are seriously affected with a canker ascribed to *V. mali*, the only organism found to be present, *Bacillus amylovorus* being specifically exonerated. No local apple variety of economic importance is resistant under every ordinary condition. Growth of mycelium corresponds to increase of cane sugar or glucose.

Illinois blister canker (*Iowa Sta. Rpt. 1925, pp. 51, 52*).—It is claimed that Illinois blister canker can be controlled by frequent inspection of apple trees and the removal of the cankers before they have progressed too far. Wounds caused by cutting out the cankers should be covered with white lead mixed with raw linseed oil to which corrosive sublimate is added at the rate of 0.5 oz. to each quart of the paint.

Fire blight, E. L. Nixon (*Pennsylvania Sta. Bul. 203 (1926), pp. 22, figs. 17*).—The author describes fire blight of apple trees, paying particular attention to the wintering over of the organism, resistance of stocks, etc. It is said that there are indications that the encysted condition in hold-over cankers may occur more frequently in some varieties than in others, and possibly the encysted condition may never develop in some varieties. There is evidence that the encysted condition always develops in certain susceptible varieties, and if varieties are resistant or immune to the encysting stage of the bacteria the problem of blight control is minimized or eliminated.

The author claims that the outstanding difficulty of fire-blight control is that a hold-over condition of some kind exists on the root system of the apple, through which the disease is perpetuated in the roots until too frequently death of the infected trees occurs.

The ultimate solution of the root-blight problem is believed to be the propagation of resistant or immune varieties of apple on their own roots, and the growth of susceptible varieties on such immune root systems.

Apple scab and foliage injury, H. H. Whetzel (*Abs. in N. Y. State Hort. Soc. Proc., 69 (1924), pp. 76–78*).—The rather general occurrence of apple scab infection on foliage in western New York during the season of 1923 was accompanied in most cases by severe injury following the application of spray and dust mixtures. The scab fungus, it is explained, destroys the protecting leaf cuticle, thus giving free access for the toxic substance to the inner portions of the leaf, the cells of which are killed by the poison over an area somewhat larger than the scab spot. The lesions may be numerous enough to allow severe injury, which in the instances referred to was associated about equally with all mixtures, either dust or spray, applied during the very hot weather of late June or early July, particularly when applied, as in many instances, while the foliage was wet with dew or rain. No injury was observed when the foliage had been kept clean by early and timely dusting or spraying. Interplanted or adjacent peach trees were sometimes severely burned, especially in case of dust with high lead arsenate content, as an 85–15 mixture. Copper also proved particularly injurious.

The use of oiled wraps in the prevention of storage troubles, C. E. Baker (*Ind. Hort. Soc. Trans., 1923, pp. 80–84*).—The life processes which are active in apples at picking time culminate in ripeness later, but they are capable of being slowed up by cold storage, though they continue at low levels even under temperatures as low as 31 or 32° F. The carbon dioxide which is given off in normal respiration rather tends to prevent scald, which appears to be due to the accumulation of aromatic organic compounds (the esters) given off if these are allowed to accumulate about the fruit, as under inadequate ventilation early in the ripening process. All the apple surfaces should be aired.

Scald is prevented largely by covering the fruits with oiled wraps early in the storage period, or it may be arrested after several months of storage by the use of oiled wraps. The most efficient wrappers should contain from 15 to 20 per cent of oil by weight. A tasteless, odorless mineral oil is preferred.

Fungicidal treatments of fruit trees [trans. title], I. Jørstad (*Nord. Jordbrugsforsk., 1923, No. 5–8, pp. 460–466*).—Experimental study of fungicidal applications to fruit trees, 1921–1922, is presented in tabular form, with discussion.

Investigations into the causes of the chlorotic condition of fruit trees in the Wellington district, R. Marloth (*Union So. Africa Dept. Agr., Sci. Bul. 29 (1924), pp. 21, pls. 6*).—Fruit tree chlorosis affects some 5,000 trees in the Wellington district and smaller numbers elsewhere. The leaves show no signs of action by bacteria or fungi, but the roots show more or less abnormality. Apparently, chlorosis may be associated, as in valley orchards, with black alkali or, as in the hill orchards, with root injury (mechanical), fungus mycelium, nematode galls, soil alkali salts, crown gall, or gummosis. The gumming root degeneration is widespread and may have been present in the young trees when planted.

I, Further investigations into the causes producing rosette of apricot and plum trees in the Wellington district. II, Report of some preliminary investigations into the influence of alkali soils on peach stocks employed for apricot and plum trees, R. Marloth (*Union So. Africa Dept. Agr., Sci. Bul. 42 (1925), pp. 30, figs. 18*).—The points dealt with in the report above noted have been further investigated, and it is stated in the first part of this bulletin that rosette and chlorotic condition of apricot and of plum trees in these districts is not due to fungi, bacteria, or virus, and that this condition is not infectious or contagious except in cases where the presence is noted of crown gall, which is communicable. A more or less general gummosis of the roots is often present. The trouble is due largely to unsuitable soil conditions, as soil shallowness, poverty, lack of humus, presence of white alkali (chlorides), or semiarid climate conditions.

Following up the observations reported in 1924, the author studied the effect of leaching soils on Italian rye grass as a preliminary experiment and on chlorides present in healthy and in chlorotic leaves of fruit trees. A great variation is observable as to chlorides present in healthy as well as in affected leaves, so that standardization as to chlorine content is not practicable. However, the chlorine content of affected leaves is almost always greater than is that of healthy leaves of the same tree. A great difference appears in the tolerance of these trees to soil chlorides. Experimentation described proved that some varieties of peach seedlings most commonly used in South Africa are not suitable for such localities as the hills of the Wellington district.

Other observations reported in outline include rosetted plum trees and observations of healthy old trees on peach stocks, confirming the conclusion that the inherited quality of the stock is of paramount importance to the tree which it has to nourish. However, poor and shallow soil, periodic drought, and alkali are predisposing conditions. Cultural and preventive management is indicated, but emphasis is placed on more suitable stocks for planting under the conditions, which are here somewhat complex.

Raspberry diseases, W. H. Rankin (*N. Y. State Hort. Soc. Proc., 69 (1924), pp. 139–145*).—The principal conclusions from experimentation conducted in 1922 and 1923, as here detailed with discussion, include raspberry mosaic, blue stem or wilt, orange rust, anthracnose, root gall, cane blight, and leaf curl.

Citrus scab [trans. title], J. R. WINSTON (*Uruguay Defensa Agr. Bol. Mens., 5 (1924), No. 2, pp. 27–42, figs. 18*).—Citrus scab, attacking many citrus forms and said to be now present in China, India, Taiwan (Formosa), Japan, Hawaii, Paraguay, Brazil, Canary Islands, and South Africa, is here said to be of secondary importance when considered with melanosis or with the rot caused by *Phomopsis citri*. Bordeaux mixture is more effective than is lime sulfur.

The search in foreign countries for blight-resistant chestnuts and related tree crops, B. T. GALLOWAY (*U. S. Dept. Agr., Dept. Circ. 383 (1926), pp. 16, figs. 5*).—An account is given of efforts made by the U. S. Department of Agriculture from 1913 to the present time in searching foreign fields for blight resistant chestnuts and related species. The most promising species of *Castanea* and *Castanopsis* are described at some length.

Commercial control of pecan scab, J. B. DEMAREE and J. R. COLE (*U. S. Dept. Agr., Dept. Circ. 386 (1926), pp. 8*).—Pecan scab, usually attributed to *Fusicladium effusum*, is said to be a disease of considerable economic importance and wide distribution throughout the Southeastern States.

Extensive experiments on the control of the disease have been carried on for a number of years, and the control measures recommended consist of spraying at suitable times with Bordeaux mixture or lime-sulfur solution. As a supplementary measure, orchard sanitation is recommended.

Walnut rot [trans. title], M. GARD (*Rev. Vitic., 63 (1925), No. 1643, pp. 417–420*).—In a continuation of the discussion previously noted (E. S. R., 52, p. 749; 53, p. 50), the author deals with a walnut rot associated with *Armillaria mellea*, discussing also measures looking to protection against loss from this disease, which include surgery, sanitation, and soil fertilization.

The watermark disease of the cricket-bat willow (Salix caerulea), W. R. DAY (*Oxford Forestry Mem. 3 (1924), pp. 30, pls. 6, figs. 3; abs. in Roy. Bot. Gard. Kew, Bul. Misc. Inform., No. 5 (1925), pp. 239, 240*).—In this paper the results are given of the study of a disease which for some years has been epidemic on *S. caerulea* in the counties of Essex and Hertfordshire. The disease affects chiefly the larger trees, as a die-back of the crown, causing their death in two years or more. A gradual bark die-back is hastened by infection with *Cytospora chrysosperma*. The die-back is due chiefly to stoppage of water supply, and it, therefore, takes the form of a general wilt over the branches affected. The disease is favored by a wet subsoil and by too close planting. Freshly dying branches always yield an organism which has been described as definitely causal and has been provisionally named as a new species, *Bacterium salicis*.

Fern rusts and their aecia, J. C. ARTHUR (*Mycologia, 16 (1924), No. 5, pp. 245–251*).—"The evidence here brought forward, deduced from six genera and nearly 40 species, seems strongly to support the view that the fern rusts taken together show primitive characteristics, and that primitive rusts, so far as we can judge of them from existing species, were long cycled, with many spore forms, and found their support upon two groups of unrelated hosts. How long such a condition existed before the full complement of spore forms and the saltation of hosts were reduced there is now no way of deciding, as fossil evidence is not available."

A bacteriosis of prickly pear plants (Opuntia spp.), T. H. JOHNSTON and L. HITCHCOCK (*Roy. Soc. So. Aust. Trans. and Proc., 47 (1923), pp. 162–164*).—During and after 1920, the authors studied a disease affecting, in Florida, the prickly pears *O. tomentella* from Guatemala and *O. ficus indica* from Colombia. An organism isolated as presumably causal is named *Bacillus cacticidus*.

Results of attempts at inoculation of cacti and of other plants are discussed in connection with possible carriers.

It is thought that *B. cacticidus* may play a very important rôle in prickly pear eradication in Australia during the moist summer by becoming associated with the larval stages of the moths Melitara and Mimorista especially, also possibly with adult Drosophilid flies and the larvae of Moneilema beetles. Without the aid of such carriers only local lesions are produced, indicating wound parasitism. Prickly pear species now occurring in Australia and known to be subject to attack include *O. tomentosa*, *O. inermis*, *O. stricta*, *O. aurantiaca*, *O. megacantha*, *O. ficus indica*, and *O. monacantha* (*vulgaris*).

Biological researches in thistle rust [trans. title], C. Ferdinandsen (*Nord. Jordbrugsforsk., 1923, No. 5–8, pp. 475–487, pls. 4*).—Experimentation is indicated as carried on during 1915–1920, looking to control of Canada thistle, partly by means of thistle rust (*Puccinia suaveolens*).

In field and laboratory tests it was shown that spring infection of *Cirsium arvense* by *P. suaveolens* was conditioned on infective material (teleutospores) from the autumnal generation. A small percentage of the new shoots are attacked in the spring at the soil surface, the infection spreading both upward and downward. It does not seem advisable to attempt the control of Canada thistle by means of thistle rust.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Key-catalogue of the worms reported for man, C. W. Stiles and A. Hassall (*U. S. Pub. Health Serv., Hyg. Lab. Bul. 142 (1926), pp. 69–196*).—This is part 2 of the authors' Host Catalogue, Index Catalogue of Medical and Veterinary Zoology (E. S. R., 53, p. 855).

Rocky Mountain spotted fever, R. R. Parker and R. R. Spencer (*Pub. Health Rpts. [U. S.], 41 (1926), No. 11, pp. 461–469*).—This is the report of a study of the relationship between the presence of Rickettsia-like organisms in tick smears and the infectiveness of the same ticks.

Reduction of the loss caused by insects, M. Afzal Husain (In *Some Modern Problems of Scientific Research for the Improvement of Cotton Growing. [Bombay]: Indian Cent. Cotton Com., 1926, pp. 46–59*).—This paper, presented at the Indian Science Congress held at Bombay in January, 1926, is a discussion of the subject as related to insect enemies of the cotton plant.

An insect olfactometer, N. E. McIndoo (*Jour. Econ. Ent., 19 (1926), No. 3, pp. 545–571, figs. 8*).—The author gives a detailed description of an insect olfactometer which consists of a specially constructed Y-tube through which insects pass from a dark chamber, being attracted by a light suspended near the free ends of the forks of this tube.

On the possibility of development of tolerance to arsenic by individual insects, F. L. Campbell (*Jour. Econ. Ent., 19 (1926), No. 3, pp. 516–522*).—The author reports upon an unsuccessful attempt made to induce a detectable tolerance to arsenic in individual silkworms by administering by mouth a number of sublethal doses of neutral sodium arsenate solution during the course of larval development.

Experiments with certain arsenates as soil insecticides, B. R. Leach (*Jour. Agr. Research [U. S.], 33 (1926), No. 1, pp. 1–8*).—In control work with the Japanese beetle (*Popillia japonica* Newm.) at the Japanese Beetle Laboratory, Riverton, N. J., it was found that the larva dies when it feeds in soil containing a sufficient amount of certain arsenates. Those tested were basic and acid lead, magnesium, zinc, copper, calcium, and ferric arsenates,

The basic lead, magnesium, and ferric arsenates were nontoxic to the larvae and also to the plants. From the standpoint of larval toxicity, acid lead arsenate proved most satisfactory, and of the arsenates that were lethal to the larva it was the least toxic to the plants. At a soil temperature of 60° F. the larva succumbs to the acid lead arsenate when feeding in soil treated with the compound, the number of days required to kill the larva depending upon the concentration of arsenate. Nasturtium, snapdragon, *Pteris wimsetti*, *Vinca minor*, *Clematis paniculata*, and *Poa annua* grew normally in acid lead arsenate applied at the rate of 2,000 lbs. per acre. Many plants showed considerable tolerance for the compound, while many others tested were severely checked in growth. Acid lead arsenate applied at the rate of 1,500 lbs. per acre is now being used to a considerable extent by nurseries in the area infested by the Japanese beetle. Acid lead arsenate undergoes chemical change when mixed with moist soil, the tendency being toward the formation of basic arsenates. The results of experiments in coating the particles of lead arsenate for the purpose of resisting soil action have been negative so far. The ultimate effect of lead arsenate on the soil is not known at present.

A homogeneous carbon disulphide emulsion, W. E. Fleming (*Jour. Agr. Research [U. S.], 33 (1926), No. 1, pp. 17–20*).—Attempts at the Japanese Beetle Laboratory to make a concentrated emulsion of carbon disulfide for the destruction of the immature stages of the Japanese beetle in the soil that would not be variable in the concentration of the dispersed phase resulted in a preparation which is transparent, homogeneous, and readily measured in small quantities. It is necessary to pour an equal volume of water into the emulsion and agitate it before adding to the larger volume of water used in the insecticidal treatment. The emulsion contains 13.5 gm. potassium hydroxide, 193 cc. 95 per cent ethyl alcohol, 77 cc. oleic acid, 700 cc. carbon disulfide, and 30 cc. of cottonseed oil.

Ortho-toluidine as a contact insecticide, W. E. Fleming (*Jour. Econ. Ent., 19 (1926), No. 3, pp. 511–515*).—This is a contribution from the Japanese Beetle Laboratory, at Riverton, N. J. In the author's experiments emulsions of *o*-toluidine, an amino-derivative of toluene, were sprayed on the adult Japanese beetle to test their value as contact insecticides. The preliminary results in the laboratory indicate that the compound has a definite toxic action on the beetle, and that it might prove valuable as a contact insecticide.

Modifications of methods for making cold-mixed oil emulsions, C. H. Richardson and E. L. Griffin (*Jour. Econ. Ent., 19 (1926), No. 3, pp. 525–529*).—It is stated that a cold-mixed lubricating oil emulsion can be made by the addition of 8 liquid oz. of crude cresylic acid, cresol U. S. P., or cyclohexanol to the usual proportions of potassium fish oil soap called for in the boiled emulsion formula, adjusting the water content to give about 68 per cent oil by volume. The paste of oil, soap, and cresylic acid first obtained may be diluted at once with water to form a stock emulsion, or stored for future use. It will keep indefinitely if evaporation is prevented, but should be mixed with a little water before being poured into the spray tank. When diluted to spray strength, this emulsion has the stability and small droplet size characteristic of diluted miscible oils.

Any petroleum oil from kerosene to lubricating oil of high viscosity can be used to prepare this emulsion. A good cold-mixed emulsion can also be made with 2 gal. of oil and 1 qt. of potassium fish oil soap. The soap-oil paste may be stirred at once into 3 qt. of water to make a stock emulsion or held for future use. Such emulsions appear to be as stable as those prepared according to the usual boiled emulsion formula.

A field method for determining the oil strength of sprays, E. L. Griffin and C. H. Richardson (*Jour. Econ. Ent., 19 (1926), No. 3, pp. 522–525*).—The authors find that the Babcock method for the determination of butterfat in milk and cream can be modified to give the percentage by volume of oil in concentrated and spray-strength petroleum oil emulsions. The modified method is adaptable to emulsions containing soap, cresol, glue, and probably other organic emulsifying agents, and can be used during spraying operations in the field. It is simple and can be used by nontechnical men.

Airplane dusting of peach orchards, O. I. Snapp (*Jour. Econ. Ent., 19 (1926), No. 3, pp. 450–459*).—This is a report upon preliminary work conducted in the Georgia peach belt. It is pointed out that definite recommendations on the subject of airplane dusting in peach orchards can not be made until this new method of applying insecticides has been tested under varying conditions of weather and infestation. Tentative conclusions, however, are drawn.

Preliminary experiments on the use of chloropicrin as an insect fumigant in flour and cereal mills, A. L. Strand (*Jour. Econ. Ent., 19 (1926), No. 3, pp. 504–510, pl. 1*).—In this contribution from the Minnesota Experiment Station, the author reports that chloropicrin, the "tear gas" of war days, has been very successfully used to combat common insects found in flour and cereal mills. The liquid chloropicrin, diluted with an equal quantity by volume of carbon tetrachloride, is best applied within the milling equipment by vaporizing the fumigant in the elevator heads while the mill is running. It is this use of the fumigant within the machines and elevator legs without fire hazard and without serious personal danger that constitutes its greatest advantage. Small amounts of it can be used to destroy infestations in conveyors, bins, or pieces of idle equipment without interfering with the normal operation of the mill. The preliminary experiments indicate plainly that frequent fumigations with chloropicrin will keep mill infesting insects down to minimum numbers and greatly increase the intervals at which general fumigations are necessary.

Earlier reports of the work have been noted (E. S. R., 55, pp. 252, 254).

Chloropicrin: A bibliography, with special reference to the use of chloropicrin as an insecticide (1848–1925), compiled by R. C. Roark (*U. S. Dept. Agr., Bur. Chem., Chem. Bibliog. 1 (1926), pp. 73*).—This is an annotated bibliography of 287 titles in mimeographed form. An index is included.

Three injurious insects recently introduced into Connecticut, W. E. Britton (*Jour. Econ. Ent., 19 (1926), No. 3, pp. 540–545*).—The author reports upon injury to lawns by the Asiatic beetle (*Anomala orientalis* Waterh.), injury to birch by the European birch leaf-miner (*Fenusa pumila* Klug), and injury to rose by *Agrilus viridis fagi* Ratz., also from Europe.

[Report of entomological and zoological work at the Iowa Station] (*Iowa Sta. Rpt. 1925, pp. 43–46*).—Brief statements are made of the occurrence of insect enemies of wheat, cutworms and army worms, wireworms, codling moth, apple curculio, tree crickets, the striped cucumber beetle, and of honey flow conditions during 1924 which are said to have been more favorable than during the four years preceding.

The study of live snakes in cages and in the open was continued during the year, and numerous observations made on their food and feeding habits, breeding habits, growth, and on their parasites.

Annual report of the zoology and entomology department, R. W. Harned (*Mississippi Sta. Rpt. 1924, pp. 24–28*).—Reference is made to a biological and ecological study of Tachinidae parasitic on insect pests of southern crops, by

H. W. Allen, including *Archytas annalis* Fab., a report upon which has been noted (E. S. R., 55, p. 157), *Winthemia quadripustulata* Macq., and others.

Reporting upon continued studies of Mississippi scale insects (E. S. R., 52, p. 252), it is stated that at least six species not previously recorded from Mississippi have been discovered, namely, *Aspidiotus destructor* Sign., *A. diffinis* Newst., *Lecaniodiaspis tessellata* Ckll., *Lecanium corrugatum*, the green shield scale, and *Lepidosaphes newsteadi* (Sulc.).

In the pecan insect project, reference is made to work started with the pecan weevil, which has been observed for the past six to eight years to be increasing in importance. Studies were made of the fall webworm and of seven species of Phylloxera attacking the pecan. Work with crawfish was continued by R. N. Lobdell. It was found that about 90 per cent of all cases of *Cambarus blandingii acutus* pass the aestivation period with a male and a female to each hole. Reference is made to the appearance of the periodical cicada in many parts of the State during the spring.

[Entomological work at the North Dakota Station], R. L. Webster (*North Dakota Sta. Bul. 194 (1926), pp. 58–62, fig. 1*).—Among the several species of insects attacking the potato in North Dakota studied during the biennium ending June 30, 1925, are the potato aphid, which was observed in plats on the college grounds, the green form being most common in the State, although the pink variety has been observed occasionally; and the potato flea beetle. *Gryllus assimilis* Fab., officially known as the field cricket, has been studied, and but little success obtained with poison bran baits as means of control. For killing crickets on a small scale and preventing them from entering houses, powdered sodium fluoride gave excellent results when dusted about in locations frequented by the crickets out of doors. Parasitism of the Hessian fly by its natural enemies is said to have been of relatively little importance in the State. Honey yields were exceptionally high in the State, the average for 10 years having been 90 lbs. per colony.

Fifteenth report of the State entomologist and plant pathologist, 1924–25, W. J. Schoene (*Va. State Crop Pest Comn. Quart. Bul., 7 (1926), No. 4, pp. 31, figs. 3*).—In discussing the work of the year the author reports upon the discovery of the potato tuber worm in potatoes in Northampton and Accomac Counties in the autumn of 1923, since which time it has become a serious pest over an area of probably 50 square miles, with a scattering infestation over a much larger area. The oriental peach moth, boll weevil, codling moth, wooly apple aphid, Mexican bean beetle, apple aphid, Angoumois grain moth, southern pine beetle, corn ear worm, green soldier bug (*Nezara hilaris*) on Lima beans, and the flannel or puss moth (*Megalophyge opercularis*) are discussed, and an account of red-banded leaf roller, (*Eulia*) *Argyrotaenia velutinana* Wlk., investigations, by W. S. Hough (pp. 14, 15), is included.

[Report on entomology], C. P. Lounsbury (*Union So. Africa Dept. Agr. Jour., 11 (1925), No. 6, pp. 577–586*).—This is a report of the chief of the Division of Entomology, Union of South Africa, on work for the year ended June 30, 1925 (E. S. R., 54, p. 455).

Control work with the European corn borer, which was thought to have become established in Johannesburg through importations of broomcorn, appears to have resulted in its eradication. In South Africa, however, broomcorn is infested with a native corn stalk borer, *Busseola fusca*. The eucalyptus snout beetle, introduced from Australia and causing depredations in extensive plantations of eucalyptus, is said to be spreading rapidly over the Union of South Africa and is already widespread both in the southwest and southeast of the

Cape Province, in central Natal, and over a large territory around Johannesburg in the Transvaal. The San Jose scale continued to advance in the three northern provinces. The citrus nematode (*Tylenchulus semipenetrans*) has been discovered in various citrus nurseries by microscopic examination of the fine roots.

[Economic insects in Burma], C. C. GHOSH (*[Burma Dept. Agr.] Rpt. Ent., Mandalay, and Seric. Work, 1925, pp. 10+8*).—This consists of a Report of the Entomologist, Mandalay, for the Year Ended June 30, 1925 (pp. 1–10), followed by a Report on the Sericultural Work for the same period.

Report of the Imperial entomologist, M. AFZAL HUSAIN (*Agr. Research Inst., Pusa, Sci. Rpts., 1924–25, pp. 58–65*).—This is a report of the work of the year, including observations on the occurence of a few of the more important insects, etc.

Control of the snowy tree cricket in prune orchards, C. WAKELAND (*Jour. Econ. Ent., 19 (1926), No. 3, pp. 460–466*).—In this contribution from the Idaho Experiment Station, the author reports that the snowy tree cricket is the cause of severe loss to prune growers of southwestern Idaho. It feeds on prune leaves for several days before attacking the fruit, and can be effectively and economically controlled in an orchard at this time by the application of 0.14 lb. of undiluted calcium arsenate dust per tree, or by spraying with lead arsenate at the rate of 4 lbs. per 200 gal. of water.

The 1925 outbreak of the beet leafhopper (Eutettix tenella Baker) in California, H. H. P. SEVERIN and E. A. SCHWING (*Jour. Econ. Ent., 19 (1926), No. 3, pp. 478–483*).—The authors report that the spring dispersal of the beet leafhoppers in the San Joaquin and Salinas Valleys during 1925 was the earliest since records have been taken in California, but that the migratory flights in the Sacramento Valley were earlier in 1921. A disastrous outbreak of curly leaf occurred, and about one-third of the beet crop was either plowed under or was not worth harvesting in the Sacramento Valley, while in the interior regions of the Salinas Valley curly leaf wiped out all of the late plantings. The summer brood adults flew at least 3 miles from beet fields planted in March, April, and May to beet fields planted in June in the Sacramento Valley. A partial second brood developed on the foothills in the Salinas Valley and flew into the fog belt, causing serious injury to late planted beets.

A new and important species of leafhopper injuring apple in Ohio, D. M. DELONG (*Jour. Econ. Ent., 19 (1926), No. 3, pp. 469, 470, fig. 1*).—Under the name *Empoa (Typhlocyba) malini* the author describes a new species of leafhopper that has been found causing decided losses on apple in central Ohio. It was the most abundant species on apple during the past two years. The species closely resembles *E. rosae*, with which it has apparently been confused.

The pea aphid as an alfalfa pest in Kansas, R. C. SMITH and E. W. DAVIS (*Jour. Agr. Research [U. S.], 33 (1926), No. 1, pp. 47–57, figs. 3*).—In this contribution from the Kansas Experiment Station, the authors report upon three outbreaks of the pea aphid in Kansas, one of major importance. Observations were made upon the behavior of the insect in the field and upon some features of its life economy, by rearings on alfalfa in a field laboratory, in the chambers of a controlled-temperature apparatus, and in an ordinary greenhouse.

The optimum temperature for this aphid seemed to be at or near 65° F., at a humidity of about 80 per cent, but the exact optimum could not be determined. The aphids were most plentiful in the field during the months which have an average temperature near 65°, namely, April, May, September, and October. There is a strong indication that the rainfall of March is a governing factor with respect to possible damage to alfalfa in Kansas. It was difficult, and

in some cases impossible, to maintain an unbroken line in the field insectary during the summer. The aphids are very scarce in alfalfa fields also at this time. There is an indication that the high summer temperatures and low humidity are predominating influences, although natural enemies are also a factor. The pea aphids overwinter at Manhattan chiefly as nymphs and adults, but eggs were taken during the winter of 1924.

The fruit tree leaf roller and its control by oil sprays, I. M. HAWLEY (*Utah Sta. Bul. 196 (1926), pp. 16, figs. 9*).—An account of *Archips argyrospila* Wlk., which during the past five years has been destructive in at least five counties in Utah, although in none of these places has the infestation been general. The account includes a discussion of the control work conducted in the State, which has led to the recommendation that an 8 per cent miscible oil (1 gal. of oil to each 11.5 gal. of water) emulsion, or a 6 to 8 per cent lubricating oil emulsion, be applied to apple trees in the spring before the buds begin to open.

The apple fruit moth or "miner" (Argyresthia conjugella Zeller), R. S. M'DOUGALL (*Scot. Jour. Agr., 9 (1926), No. 1, pp. 54–61, pls. 3*).—A summary of information is given on *A. conjugella*, which during 1925 attacked apples over an extended area in the north and northeast of Scotland, this being the first record of its occurrence on apples in Scotland. Its normal host is the berry of the rowan or mountain ash, upon which it has been found for a number of years in England. It has been recorded as a fruit pest in Ireland, in Europe, Japan, and Canada, and is reported by Forbes (E. S. R., 52, p. 455) to occur from New York to British Columbia. Its attack on the apple somewhat resembles that of the codling moth, but the larva enters the side of the apple and reaches the center indirectly by a winding mine. It differs from the codling moth in that several or many larvae attack a single apple.

Bait-pails as a possible control for the oriental fruit moth, S. W. FROST (*Jour. Econ. Ent., 19 (1926), No. 3, pp. 441–450, figs. 5*).—In work at the Pennsylvania Experiment Station the bait pail method, under orchard conditions, reduced the percentage of infestation by the oriental fruit moth nearly 50 per cent and the percentage of infested fruit nearly 25 per cent. A pail of approximately 1 gal. capacity, with a 6 in. diameter, filled with about 1 qt. of bait, gave maximum catch and minimum evaporation. Fermenting baits are complex, uncertain, and soon become putrid, but at present they work the best under orchard control conditions. The addition of commercial yeasts is not necessary, as wild yeasts are present in sufficient quantities to produce fermentation. The attractiveness of a fermenting bait is due to the presence of alcohol and acids, but the evolution of hydrogen and carbon dioxide may also play a minor part. Non-fermenting baits are far more attractive than fermenting baits, but at present are not practical under orchard control conditions. Certain antiseptics, such as formalin and sodium salts, arrest the fermentation process for a considerable period of time. The females feed largely before ovipositing and are attracted to baits as readily as males.

Additional information on baits attractive to the oriental peach moth, Laspeyresia molesta Busck, 1925, A. PETERSON (*Jour. Econ. Ent., 19 (1926), No. 3, pp. 429–439, figs. 5*).—The author finds that the oriental peach moth is attracted to fermenting molasses baits from the middle of April until the middle of October, and that some or many males and females may be found in the bait containers every day during the entire season. At Riverton,

N. J., during 1925, the largest number of adults were captured during the emergence period of the first brood moths, the later broods being reduced by parasitism. It was found that more moths came to the same sort of bait located in peach orchards than in apple or quince orchards. Cheap stock-feeding molasses seems to be the most satisfactory grade for baits, dilutions of 1 to 10 and 1 to 20 being more satisfactory than weaker or greater strengths. Corn sirup, particularly the colorless grade, diluted 1 to 20 with water, attracted large numbers of moths.

The regulation of the movement of fruit and nursery stock in relation to the distribution of the oriental fruit moth (Laspeyresia molesta Busck), T. J. Headlee (*Jour. Econ. Ent., 19 (1926), No. 3, pp. 440, 441*).—The author doubts whether regulatory action for preventing the spread of this insect is worth the time and effort. In his opinion, public moneys spent upon finding efficient methods of controlling the insect will, in the long run, return far better dividends than can be had through any regulatory action intended to delay spread.

Look for the European corn borer, S. B. Fracker and C. L. Fluke (*Wisconsin Sta. Bul. 385 (1926), pp. 8, figs. 5*).—A description is given of this pest and the nature of its injury.

The occurrence of Phlebotomus in Panama, R. C. Shannon (*Jour. Wash. Acad. Sci., 16 (1926), No. 7, pp. 190–193, figs. 5*).—Under the name *P. panamensis*, the author describes a new species which is the only representative of the genus collected by him in the Canal Zone.

Observations on the life history of the narcissus or daffodil fly, Merodon equestris Fab., C. A. Weigel (*Jour. Econ. Ent., 19 (1926), No. 3, pp. 497–501*).—This is a report of observations made of the narcissus bulb fly at Washington, D. C. This species overwinters in the larval stage and pupation normally occurs during April. The higher temperatures of the greenhouse apparently hastened pupation, since it took place during February, whereas outdoors it did not occur until April. Adults emerged from April 24 to June 4, and their longevity ranged from 4 to 17 days. Extracted honey proved to be a suitable food for the adults under cage conditions. Sunlight appeared to be a requisite for mating and egg deposition. Eggs were laid on the bulbs and hatched in from 2 to 9 days. Newly hatched larvae began feeding in the bulbs during May and June and were nearly full grown by November. Ordinary earthen bulb pans, plunged in sand in specially constructed boxes placed in a cold frame, served as suitable life history cages.

Work and parasitism of the Mediterranean fruit fly in Hawaii in 1921, H. F. Willard and T. L. Bissell (*Jour. Agr. Research [U. S.], 33 (1926), No. 1, pp. 9–15*).—The authors report that the infestation of fruits in Hawaii by the Mediterranean fruit fly and the work of the four introduced species of parasites during 1921 was not to any great extent different from that of the four years preceding (E. S. R., 50, p. 54). The percentage of parasitism by *Opius humilis* continued to decrease, and this parasite was still in third place from the standpoint of parasitism over yearly periods. *Tetrastichus giffardianus* advanced from fourth to second place. The four introduced parasites destroyed approximately one-half of all the fruit flies about Honolulu during the period 1917–1921.

Field tests with repellents for the screw worm fly, Cochliomyia macellaria Fab., upon domestic animals, E. W. Laake, D. C. Parman, F. C. Bishopp, and R. C. Roark (*Jour. Econ. Ent., 19 (1926), No. 3, pp. 536–539*).—The authors present the results of tests of a number of promising repellents when used under range conditions for the protection of cattle, sheep, goats, and

other animals against *C. macellaria*. In these experiments the worms were first killed with benzol and the repellents applied every other day until the wounds were healed. Considering effectiveness and various other factors, pine tar oil, with specific gravity of 1.065, ranked first among the materials tested. The 18 repellent mixtures used in these experiments were selected as being the most effective of several hundred, as determined by extensive laboratory tests.

Repellent sprays for flies attacking dairy cattle, C. R. CLEVELAND (*Jour. Econ. Ent., 19 (1926), No. 3, pp. 529–536*).—*This is a contribution from the* Indiana Experiment Station, reporting upon two seasons' tests conducted under practical farm conditions. The more promising commercial and home-mixed materials were tested. Of all these a new, exceedingly inexpensive spray composed of used crank case oil and oil of tar in proportions of 1 gal. to 1 pint has *offered the most promising results in terms of effectiveness, cost,* and practicableness from every standpoint.

The tsetse-fly problem and its solution (*Soc. Preserv. Fauna of Empire [London], Occas. Papers No. 1 (1925), pp. 10, pl. 1*).—This memorandum was drawn up after consultation with high authorities on tsetse flies and their *relation to diseases of men and animals.*

Results of life history studies of Diabrotica 12-punctata Fab. (Chrysomelidae, Coleoptera), H. L. SWEETMAN (*Jour. Econ. Ent., 19 (1926), No. 3, pp. 484–490, fig. 1*).—A report is made of life history studies of *D. 12-punctata* at the Iowa Experiment Station. The adults appeared in early June and began ovipositing immediately, the greater portion of egg laying ending in July. About 40 days were spent in the immature stages. Most of the adults emerged in July and August, but reproduction was apparently delayed until the following year.

Xanthonia decem-notata Say, an apple pest in Maine (Coleoptera, Chrysomelidae), C. R. PHIPPS (*Jour. Econ. Ent., 19 (1926), No. 3, pp. 466–469, pl. 1*).—In this contribution from the Maine Experiment Station it is stated that *X. decem-notata*, previously unrecorded in economic literature, has been very destructive to the apple in one district in the State. It has been recorded for a long time as an unimportant leaf feeder on the oak, beech, and elm, being generally distributed throughout the eastern United States and Canada and having been taken as far west as Texas.

In the infested region in Maine the adult beetles migrate from other host plants to the apple in September, and in the course of two or three weeks the market value of the entire crop may be ruined by the abundant shallow feeding punctures scattered over the surface. The trouble has been present in the same orchard for 16 years and has gradually increased in severity, from 75 to 90 per cent of the Russet apple crop having been injured in 1925. The beetles on the apple trees were collected in tightly curled dry leaves during the day. Observations in the laboratory and orchard suggest that they are night feeders because they are characteristically hidden by day. Two new host plants besides the apple, the wild raspberry and the linden, are recorded as a result of feeding experiments.

The bronze-beetle, D. MILLER (*New Zeal. Jour. Agr., 32 (1926), No. 1, pp. 9–14, figs. 8*).—An account of the life history, habits, and control of this beetle, which is conspicuous mainly for its damage to developing apples, though it also attacks pear, plum, peach, gooseberry, black currant, raspberry, and blackberry.

Observations on the biology of Melanotus communis and Melanotus pilosus, F. A. FENTON (*Jour. Econ. Ent., 19 (1926), No. 3, pp. 502–504*).—These observations, made at the Iowa Experiment Station, relate to two of the most

common wet land wireworms in Iowa. *M. communis* and *M. pilosus* have a six-year life cycle, the adults laying eggs chiefly in June of the first year, the larvae hatching mostly by July. The second, third, fourth, and fifth years are spent in the larval stage. Pupation takes place usually in August of the sixth year, and the adults emerge on an average of from 14 to 18 days later. These adults hibernate in protected situations above the ground, issuing from hibernation next year in May and June. The food of the adults is chiefly pollen.

The economic importance of the carrot weevil in Illinois, S. C. Chandler (*Jour. Econ. Ent., 19 (1926), No. 3, pp. 490–494, fig. 1*).—The author records a severe infestation of carrots by the carrot weevil (*Listronotus latiusculus*) in an area in southern Illinois lying mostly within a 40-mile radius of East St. Louis. A record of its distribution, studies of its life history and habits, and a note on its taxonomy are given.

A new carrot pest, with notes on its life history, H. M. Harris (*Jour. Econ. Ent., 19 (1926), No. 3, pp. 494–496, pl. 1*).—A weevil, *Listronotus rudipennis* Blat., apparently heretofore unrecorded as a pest, has been found attacking carrots in Iowa. The injury is done by the larvae, which tunnel and feed on the underground parts of the plants. In severe infestations as much as 90 per cent of the crop is rendered unfit for human consumption. The weevil requires about 31 days to complete its life cycle from egg to adult, breeding being continuous throughout the summer.

Boll weevil work, C. T. Ames (*Mississippi Sta. Rpt. 1924, pp. 42, 43*).—Studies at the Holly Springs Substation are briefly reported upon. Seven hundred sixty-nine hibernating weevils per acre entered one field between May 30 and June 26. Hill's Mixture gave the best results, the home mixture second, and the dust third. It is concluded that any of these three forms of poison would give satisfactory results if applied in the presquare stage. It is recommended that one presquare application be used, with a second 10 days later, preferably with dust calcium arsenate. When there is a 10 per cent or more infestation the dust calcium arsenate is recommended. Five hundred pounds of seed cotton per acre was the average gain made where early poisoning was used.

The Mexican cotton boll weevil, W. Newell, E. F. Grossman, and A. F. Camp (*Florida Sta. Bul. 180 (1926), pp. 221–247, pls. 4, figs. 3*).—In this bulletin the authors give a brief account of the boll weevil and discuss control methods now being used successfully.

Biology and control of the white-pine weevil, Pissodes strobi Peck, S. A. Graham (*New York Cornell Sta. Bul. 449 (1926), pp. 32, figs. 15*).—This is an account of the life history, habits, and means of control of *P. strobi*, based upon investigations begun by the author in the summer of 1915. An account of the author's work with this weevil at the Minnesota Experiment Station has been noted (E. S. R., 39, p. 159).

The author concludes that, of the direct methods that have been developed for the control of this insect, a combined collecting of adults in the spring and pruning of injured leaders in the summer is the most effective. The best method of collecting adults is to jar the beetles from the trees into a net held beneath them. Pruning of injured leaders should be done in June and again in August, or, if only one treatment is to be given, in July. Pruning all but one lateral tends to stimulate recovery and is a desirable operation when possible. Sprays and washes have been recommended for the control of the white-pine weevil, but they have not proved sufficiently effective to warrant their use.

In timber forests, one of two practical methods of indirect control can be used. In established forests on good soil, white pine should be grown under a form of the shelter-wood system that will provide a light shade for the young

trees until they have reached a height of from 20 to 30 ft., although the shade should not be sufficiently heavy to interfere seriously with the growth of the trees. The second method is to encourage a dense stand, which has been found to stimulate straight growth.

Parasites and predatory agents are said to play an important part in the natural control of this insect, the most abundant and effective being *Eurytoma pissodis* Gir., which, in some cases, parasitizes more than 50 per cent of the weevil larvae.

Tula's Experiment Station for Apiculture, T. A. TUENIN (*Amer. Bee Jour., 66 (1926), No. 3, pp. 126–128, figs. 4*).—A description of a station organized in 1919 and located about 7 km. north of the town of Tula, Russia.

Some facts relative to the raspberry crown borer (Bembecia marginata), T. J. HEADLEE and C. ILG (*Jour. Econ. Ent., 19 (1926), No. 3, pp. 471–477, fig. 1*).—In experiments at the New Jersey Experiment Stations it has been found that all larvae of this pest, officially known as the raspberry root borer, pupate in the latter part of the summer. Its work on both raspberry and blackberry seems to be of a corn-boring nature. Tobacco dust, properly used, destroys all larvae and leaves plants apparently unhurt.

Cardiochiles nigriceps Vier., an important parasite of the tobacco bud worm, Heliothis virescens Fab., F. S. CHAMBERLIN and J. N. TENHET (*Jour. Agr. Research [U. S.], 33 (1926), No. 1, pp. 21–27, figs. 4*).—The authors found *C. nigriceps* to be the most important insect parasite of *H. virescens* in the southeastern part of the United States, the parasitism by this species frequently ranging from 50 to 100 per cent in July and August. So far as the authors are aware, this parasite attacks only the true bud worm of tobacco. At Quincy, Fla., the combined incubation and larval periods required from 17 to 21 days during the summer months, and the pupal period ranged from 8 to 12 days.

ANIMAL PRODUCTION

Animal nutrition work [at the Iowa Station] (*Iowa Sta. Rpt. 1925, pp. 39, 40*).—The continuation of the study of the effect of mineral supplements (E. S. R., 53, p. 768) has dealt largely with the value of salts of manganese, iron, sodium, potassium, silicon, and fluorine in the diets of rats. The composition of the basal rations modified the results obtained, but studies of reproduction and longevity through several generations have indicated a value for small amounts of manganese and probably aluminum oxide. Sodium silicate, iron, and elemental sulfur insoluble in carbon disulfide have given negative results, while sulfur soluble in carbon disulfide was detrimental. The requirement of sodium chloride was found to vary with different rations, but an excess had an unfavorable influence on gains in weight and reproduction. An excess of potassium salts was also generally detrimental, though potassium phosphate was least harmful of the various potassium compounds tried. The effects of fluorine were found to be similar to those noted in the previous report.

Research service to Massachusetts animal industry (*Massachusetts Sta. Bul. 230 (1926), pp. 137–164, pl. 1*).—This bulletin gives brief reports of the following experiments, which have been mainly noted from other sources: Mineral Matter for Dairy Cows and Skim Milk Powders in the Rearing of Young Calves, both by J. B. Lindsey and J. G. Archibald (E. S. R., 54, p. 571; 53, p. 473); Better Feed from Permanent Pastures, by S. B. Haskell (E. S. R., 51, p. 34); The Utilization of Feeds by Horses, by J. B. Lindsey and J. G. Archibald (E. S. R., 55, p. 163); and Improving the Feeding Value of Grain Hulls and Sawdust, by J. G. Archibald (E. S. R., 51, p. 372).

Market classes and grades of livestock, C. E. GIBBONS (*U. S. Dept. Agr. Bul. 1360 (1926), pp. 48, figs. 27*).—Schedules of the various classes and grades of cattle, sheep, and swine are presented, with descriptions and illustrations of the individuals selected as representative of the different classes and grades.

Cattle feeding experiments [at the Iowa Station] (*Iowa Sta. Rpt. 1925, pp. 20, 21*).—Brief reports are given of the results of two experiments in the fattening of steers. The first, dealing with the effect of minerals, has been noted previously (E. S. R., 55, p. 160). The second experiment consisted of a comparison of early- and late-cut Manchu soy bean hay and late-cut Pekin soy bean hay as substitutes for alfalfa hay in a ration of shelled corn, linseed oil meal, and block salt. The results of this test indicated that soy bean hays may be economically substituted for alfalfa hay in the fattening of steers, provided the cost is not more than one-third to one-half of the cost of alfalfa hay per ton. The mature Manchu soy bean hay was unprofitable in the experiment.

[Experiments with beef cattle at the Mississippi Station], G. S. TEMPLETON (*Mississippi Sta. Rpt. 1924, pp. 9, 10*).—The results of two experiments, which are continuations of those previously noted (E. S. R., 52, p. 269), are briefly reported.

Steer feeding.—In a second test of the relative economy of adding approximately 2.5 or 5 lbs. of blackstrap molasses to a ration of cottonseed meal, corn silage, and Johnson grass hay, three lots of 10 steers each, averaging approximately 760 lbs. in live weight, were fed. The lot receiving the basal ration only made average daily gains of 2.21 lbs., as compared with 2.50 lbs. for the lot receiving the smaller amount of molasses, and 2.24 lbs. for the lot receiving the larger supplement of molasses.

Wintering the breeding herd.—Data showing the rations, weights, and gains for the calves, yearlings, and breeding herd from January 1 to April 11, 1924, are tabulated.

Wintering beef cows in northern Montana, C. N. ARNETT, A. L. BAKER, and L. VINKE (*Montana Sta. Bul. 187 (1926), pp. 35*).—This bulletin gives the results of 4 winters' feeding experiments with beef cows in cooperation with the Bureau of Animal Industry, U. S. D. A., dealing especially with the effect of home-grown feeds on the gains made during the winter and the following summer on grass, as well as the effect of the winter gains on the fall weights of the calves dropped. From 3 to 5 rations were fed each year to different lots. The rations included alfalfa hay, corn silage, and straw; cottonseed cake, corn silage, and straw; cottonseed cake, straw, and browse; corn fodder, straw, and browse; alfalfa hay and corn silage; corn silage and straw; corn fodder and browse; corn fodder, alfalfa hay, and browse; and corn fodder, alfalfa hay, and straw. None of the rations failed to maintain the weight of the cows during the winter, but there was considerable variation in the amount of gains and the estimated cost of the rations.

The ration of corn silage, alfalfa hay, and straw produced the largest winter gains of those fed during 3 years, but proved most expensive. The ration of corn silage and alfalfa hay evidently did not furnish sufficient bulk, the gains were considerably reduced, and the estimated cost of the ration was high. Corn silage and straw produced an average winter gain of 54.4 lbs., and the estimated feed cost was $7.66 per head. Rations of corn fodder and browse, and corn fodder, straw, and browse were successfully used during 2 and 3 years, respectively.

The gains made by the cows during the summer were inversely related to their winter gains, but the lots making the greatest winter gains usually

made the greatest gains for the year. The winter gains of the cows did not appear to be related to the fall weights of the calves produced.

A comparison of the rations composed entirely of carbohydrate feeds with rations of carbohydrate feeds plus cottonseed cake or alfalfa hay showed that the weight was maintained somewhat better during the entire year on the latter rations. The cows receiving carbohydrate feeds produced calves whose fall weights were slightly greater than those produced by cows having protein feeds in the ration.

In general the results showed that beef cows could be satisfactorily wintered on home-grown feeds, corn fodder and browse being suitable for cows in fair condition of flesh. The addition of straw reduced the cost and the amount of gain. Corn silage, alfalfa hay, and straw is suggested for cows in poor condition.

Wintering beef calves and yearlings in northern Montana, C. N. Arnett, A. L. Baker, and L. Vinke (*Montana Sta. Bul. 188 (1926), pp. 29*).—This bulletin reports the results of four trials with calves and three trials with yearlings, conducted in cooperation with the Bureau of Animal Industry, U. S. D. A., to determine the comparative value of alfalfa hay and bluejoint, or western wheat grass hay, when fed with corn silage for wintering beef cattle.

Feeding experiments with calves.—Two lots of calves were fed in each of the four trials, using from 10 to 21 calves per lot, varying in average weight from 356 to 425 lbs. The experiments lasted from 90 to 167 days. The rations consisted of corn silage with alfalfa or bluejoint hay in the first 2 years, with the addition of oat straw to both rations in the third and fourth trials to correct the laxative effect of the alfalfa ration which was particularly apparent in the first year. The amounts of feed consnmed were determined by the condition and appetite of the calves. The average daily rations during the 4 years were 7.36 lbs. of alfalfa hay, 7.37 lbs. of silage, and 1.21 lbs. of straw in the alfalfa lots, and 7.06 lbs. of bluejoint hay, 7.38 lbs. of silage, and 0.84 lb. of straw in the comparative lots.

Except in the first trial the alfalfa-fed lots made greater gains, which for 4 years averaged 0.77 lb. as compared with 0.61 lb. per day, the gain of the lots receiving the bluejoint hay. An average of 9.59 lbs. of alfalfa, 9.61 lbs. of silage, and 1.58 lbs. of straw was required per pound of gain by the alfalfa lots during the 4 trials. The bluejoint lots required 11.48 lbs. of bluejoint, 12.12 lbs. of silage, and 1.39 lbs. of straw per pound of gain, indicating the superiority of alfalfa over bluejoint for producing gains economically .

In studying the effect of the winter gains on the gains made during the following summer on grass, it was found that each year the greatest gains made during the winter were followed by the smallest gains during the summer. This was similarly true for calves from the same lots.

Feeding experiments with yearlings.—The experiments with the yearlings were similarly conducted to those with the calves and for comparable periods. The average weights of the yearlings per lot in the different trials varied from 624 to 702 lbs. As with the calves, alfalfa produced greater gains than the bluejoint hay. For the combined resnlts of the 3 trials the lots receiving alfalfa consumed daily an average of 7.47 lbs. of alfalfa, 21.05 lbs. of silage, and 1.83 lbs. of oat straw, and made an average daily gain of 0.82 lb. The comparable lots consumed an everage of 7.32 lbs. of bluejoint hay, 21.15 lbs. of corn silage, and 1.47 lbs. of straw, and made an average daily gain of 0.74 lb.

It not only required more hay but also more silage per pound of gain with the bluejoint ration as compared with the ration containing alfalfa hay. As with the calves, the summer gains were largely dependent upon the winter gains, the smaller summer gains following the larger winter gains. Those

making the larger winter gains, however, made the largest gains for the entire year.

[Experiments with beef cattle at the North Dakota Station], F. W. CHRISTENSEN and T. H. HOPPER (*North Dakota Sta. Bul. 194 (1926), pp. 32–39, 53, figs. 2*).—These experiments are largely continuations of those previously noted (E. S. R., 51, p. 869).

Range pasture studies.—The results of these experiments, which have been conducted since 1915, largely confirm previous conclusions. Data showing the average daily gains and pounds of beef produced per acre on the various continuous and rotation pastures are given for 1923 and 1924.

Shipping shrink of cattle.—Studies of the shrinkage of cattle during shipment have indicated that the net loss after fill is greater when shipping a short distance than when shipping a longer distance, though the data do not warrant the formulation of definite conclusions.

Silage feeding experiments.—These studies have generally confirmed the results of the first two years.

In connection with this study the digestibility of the various silages has been determined, from which the following total digestible nutrients have been calculated per 100 lbs. of dry matter: Early cutting of sweet clover silage 55.5 lbs., late cutting of sweet clover silage 55.4 lbs., sunflower silage 43.1 lbs., corn silage 65.4, and alfalfa hay 52.7 lbs. It has been pointed out that the superiority of corn silage is evidently due to the grain content, and that the low value of sunflower silage is probably due to the large amount of fiber. Determinations of metabolizable energy per pound of digestible organic matter were as follows: Early cutting sweet clover silage 1.784, late cutting sweet clover silage 1.725, sunflower silage 1.670, corn silage 1.748, and alfalfa hay 1.700 therms.

Digestibility of prairie hay.—A total of five sets of digestion trials with 4 steers in each have been completed in which 5 lots, or grades, of prairie hay have been studied. The grasses composing the hay consisted principally of western needle grass with small amounts of other grasses as well. The hay cut in July proved to be the most palatable, with the October cutting ranking next in order, and the April cutting the least palatable of all. The calculated total digestible nutrients per 100 lbs. of dry matter in the different cuttings were as follows: April cutting 51.3, July cutting 60.1, October cutting 48.7, biennial cutting 52.5, and annual cutting 53.9 lbs. It is pointed out that the method of cutting which would yield the largest amount of digestible nutrients depends upon the relative hay yields.

Effect of winter rations on pasture gains of two-year-old steers, E. A. LIVESAY (*West Virginia Sta. Circ. 40 (1926), pp. 8, figs. 11*).—This is a summary of the publication previously noted (E. S. R., 55 p. 465).

[Lamb feeding experiments at the North Dakota Station], F. W. CHRISTENSEN (*North Dakota Sta. Bul. 194 (1926), pp. 29–31, fig. 1*).—The results of three experiments dealing with the fattening of lambs are briefly reported.

Value of pigeon grass seed for fattening lambs.—Three lots of 95 or 94 lambs were used for comparing the feeding value of pigeon grass seed with barley. All lots received approximately 1 lb. of alfalfa hay daily, together with a grain mixture consisting of 20 per cent of wheat bran. One lot, in which the balance of the grain mixture consisted of 80 per cent of barley, made an average daily gain of 0.44 lb. during 37 days. Another lot receiving 80 per cent of pigeon grass seed in the grain mixture made an average daily gain of 0.35 lb., while the third lot receiving 40 per cent of barley and 40 per cent of pigeon grass seed in the grain mixture made an average daily gain of 0.44 lb. The experiment was continued for 18 days more with a slightly modified

grain ration, and similar gains. The feed requirements of the different lots were similar.

The value of kinghead seed for fattening lambs.—Twelve lambs were given a grain mixture consisting of 26 lbs. of barley, 26 lbs. of pigeon grass seed, 28 lbs. of kinghead, and 20 lbs. of bran fed unground for 15 days. This ration did not prove palatable and the lambs did little more than maintain their weight. A further feeding period of 14 days on this ration after grinding produced average daily gains of approximately 0.25 lb., and for the following 25 days approximately 0.3 lb. per head.

Value of wild oats for fattening lambs.—Three lots of 75 range lambs each averaging approximately 57 lbs. in weight were used for comparing grain mixtures containing 80 per cent of barley, 80 per cent of wild oats, or 40 per cent of barley and 40 per cent of wild oats, when the balance of the grain mixture consisted of 20 per cent of bran, and alfalfa hay was fed as a roughage during 90 days. The respective average daily gains per head of the different lots were 0.34, 0.30, and 0.33 lb. As compared with the lot receiving the barley alone, 17 per cent more concentrates were required per unit of gain by the lot receiving the 80 per cent of wild oats and only 6 per cent more concentrates and 4 per cent more hay by the lot receiving the barley and wild oat ration.

In a further study of the feeding value of wild oats, 2 lots of 20 lambs each, averaging approximately 60 lbs. in weight, were similarly fed on grain rations containing 80 per cent wild oats and 80 per cent cultivated oats. During 90 days the average daily gains of these lots were, respectively, 0.31 and 0.32 lb. The feed requirements were also similar.

[Tests with swine at the Iowa Station] (*Iowa Sta. Rpt. 1925, pp. 62, 63*).—The work on this project which has been continued (E. S. R. 53, p. 774) indicates that there is little difference in farrowing weights and vigor of pigs from big, medium, and small types of swine, though the new born of the medium and small types were generally fatter, due to larger middles. The big type required the least feed per unit of gain to 300 lbs. in weight, though the medium type made more rapid gains and required 30 days' less time than the big type and 41 days' less time than the small type to reach a weight of 250 lbs.

[Feeding experiments with swine at the Mississippi Station], G. S. TEMPLETON and E. P. CLAYTON (*Mississippi Sta. Rpt. 1924, pp. 10–12, 13, 14*).—The results of the following feeding experiments are briefly reported.

[*Soft pork studies on soy beans.*]—In order to determine the effect of a dry lot feeding period on corn and tankage of 4, 8, and 12 weeks on carcasses of hogs previously softened by 8 weeks' feeding on soy bean pasture, two lots of 12 hogs each were grazed on soy beans for 56 days. One lot received in addition a ration of 2.5 lbs. of corn per 100 lbs. of live weight. During the pasture period the lot receiving soy beans only made an average daily gain of 1.12 lbs. per head, while the other lot made an average daily gain of 1.62 lbs. per head.

Slaughter data showed that of the 3 pigs killed from the lot receiving soy beans with corn two were soft and one was medium soft. The slaughter data on pigs which were fed for various periods on the corn and tankage ration indicated a progressive hardening effect on this ration, but the gains for the 8 and 12 weeks' feeding periods on dry lot were small and the amounts of feed consumed per unit of gain were excessive.

Rice by-product feeding experiments.—Seventy-pound pigs fed on rations of rice polish, tankage, and rye pasture, and rice bran, tankage, and rye pasture for 8 weeks did not do well and were unthrifty, indicating that these rations are not suitable for pigs of this size. When removed to dry lot and given a

ration of corn and tankage, recovery was very rapid and satisfactory gains were made during an 84-day period.

Whey for pigs, or a double feed value in milk.—In testing the comparative feeding value of skim milk and whey, two pigs fed on a ration of skim milk with equal parts of corn meal, wheat bran, and wheat shorts made gains of 41 and 42 lbs., respectively, during the 30 days. Two other pigs receiving the same basic ration, with whey replacing the skim milk, made gains of 40 and 33 lbs., respectively, during the same period. Another pig receiving the same grains without milk gained 23 lbs. in the same time.

In a second test of 20 days' duration similar results were obtained in that whey proved to be approximately as good as skim milk.

[Swine feeding experiments at the North Dakota Station], F. W. CHRISTENSEN, O. A. THOMPSON, and L. JORGENSON (*North Dakota Sta. Bul. 194 (1926), pp. 23–27, 28, 83, 84, 88, 89, figs. 4*).—The results of several experiments, some of which have been continued from previous years (E. S. R., 51, p. 872), are reported.

Bacon and lard type hogs compared.—One lot of 10 bacon hogs was compared during a 28-day feeding period with an equal number of lard type hogs when both were fed a mixture of barley, shorts, and tankage (4:5:1) with alfalfa pasture. The results showed that the bacon hogs made average daily gains of 1.5 lbs. per head as compared with 1.6 lbs. per head by the lard hogs. The former group required 2.55 lbs. of grain to produce one pound of gain as compared with 2.56 lbs. of grain required per pound of gain by the lard hogs.

In connection with the alfalfa pasturing experiment, equal numbers of bacon and lard hogs were allowed to hog off a field of Canadian peas without other feeds except alfalfa pasture and a mineral mixture. The bacon hogs made average daily gains of 1.4 lbs. as compared with 1.3 lbs. by the lard hogs.

The hogs used in the above experiments were placed on corn for a 36-day period, beginning September 17, some having access to the alfalfa and field pea pastures. The bacon hogs made average daily gains of 1.5 lbs. and the lard hogs 1.8 lbs. during this period. It is stated that the corn was somewhat immature during this hogging-off trial.

Bacon and lard hogs fed in dry lot during the test on corn made average daily gains of 1.3 lbs. per head.

Production of bacon hogs.—Seventy pigs of bacon type, bacon-lard crosses, and lard type were used in a slaughter test to determine the number from which Wiltshire sides of desirable types could be produced. The results of this test showed that 77.1 per cent of the 33 Yorkshires and 2 Tamworth × Chester White crossbreds could have produced desirable Wiltshire sides, as could 83.3 per cent of the 9 purbred Duroc Jerseys, 9 Tamworth × Duroc Jersey crosses, and 6 Tamworth × Poland China crosses. Studies at the market indicated that hogs which will produce Wiltshire sides receive a premium price, but that such individuals must be of proper breeding, type, finish, and quality and be marketed without bruises.

Prolificacy of sows and mortality of pigs.—In studies of the breeding records of 393 sows and gilts kept at the station since 1909, it was found that the average size of litter for all breeds was 9.6 pigs, and for the individual breeds was as follows: Yorkshire 11.7, Duroc Jersey 10.7, Chester White 9.6, Berkshire 8.7, and Poland China 8.2 pigs. The Yorkshires raised 74 per cent of their pigs, the Duroc Jerseys 67, the Chester Whites 73, Berkshires 69, and Poland Chinas 65 per cent. Of the pigs born 52.3 per cent were male. The greatest mortality among the pigs occurred during early life, practically 69 per cent during the first week. Pigs from mature sows were slightly heavier

at marketing time than those from gilts farrowing their first litters. The birth weights of pigs from the bacon breeds were slightly heavier than those from the lard breeds.

[*Hogging off trials at the Edgeley Substation*].—The results of 8 years' experiments indicate that field peas are equal to corn for the production of pork and are especially valuable for growing animals. An average of 384 lbs. of pork has been produced per acre of peas as compared with 391 lbs. of pork per acre of corn.

[*Hogging off trials at the Langdon Substation*].—Twenty-one hogs placed on 5.5 acres of peas for 43 days made average daily gains of 2.2 lbs. per day, which was equivalent to 361 lbs. of pork per acre. The same pigs placed on 5.5 acres of corn following the feeding on peas made average daily gains of 1.1 lbs., or a total production of 209 lbs. of pork per acre of pasture.

Hog-lot equipment, E. Z. Russell and S. S. Buckley (*U. S. Dept. Agr., Farmers' Bul. 1490 (1926), pp. II+22, figs. 26*).—Popular directions for the construction of fences, feeders, crates, and other kinds of equipment for the hog lot and piggery.

[Poultry experiments at the Iowa Station] (*Iowa Sta. Rpt. 1925, pp. 30–34*).—Brief results of experiments conducted during 1925 are reported, many of which are continuations of projects previously noted (E. S. R., 53, p. 778).

Rations for starting chicks.—Ten pens of 25 chicks each were used for determining the value of adding commercial wood charcoal or vegetable charcoal to a basal ration. The results of this experiment indicated that charcoal has a feeding value, and that the maximum amount to feed was approximately 4 per cent and the minimum amount 2 per cent of the ration. Variations in the proportion of the mash and grain fed influenced the charcoal requirement.

[*Milk proteins and methods of feeding crate fattened chickens*].—Lots of birds averaging approximately 4 lbs. each were fed for 14 days on grain rations consisting of equal parts of oat flour and corn meal. Protein supplements in the form of condensed skim milk, condensed buttermilk, and dried buttermilk were each supplied to two of the lots. In one condensed buttermilk and one condensed skim milk lot a mineral mixture replaced 5 per cent of the grain. The results showed that the minerals did not increase the gains materially in any of the feeding periods and in most cases they increased the costs.

In further experiments lots of birds were fed twice and three times daily and free will on a ration of 50 lbs. of corn meal, 50 lbs. of oat flour, and 3 lbs. of high-grade meat scrap mixed with condensed buttermilk and 135 lbs. of water per 100 lbs. of dry mixture. The feeding period lasted two weeks with weight records taken at the seventh, eleventh, and fourteenth days. The results showed that feeding twice daily gave the best results in gains and economy during the 14-day period, while feeding three times a day produced the best and most economical gains, for the 7- and 11-day feeding periods. Free will feeding produced good gains, but the cost of feed was high.

Milk feeds as a source of protein for laying hens.—Eight pens of White Leghorn pullets were selected for comparing the value of various supplements to the basal ration in a continuation of this project. The results showed that the pen receiving no protein supplement laid an average of 37 eggs per bird during the 9-months' feeding period, while the pen receiving the condensed buttermilk paste laid an average of 120 eggs per bird. Pens receiving liquid skim milk and liquid buttermilk each averaged 111 eggs per bird, while a pen receiving a choice of liquid buttermilk or water as drink laid only 80 eggs per bird. Mixing a dried buttermilk supplement with the basal mash resulted in the production of an average of 107 eggs per bird, as compared with 102 eggs when a

high protein meat meal was similarly included, and 80 eggs per bird when 60 per cent of protein tankage was mixed with the basal mash.

From these results it is concluded that dried buttermilk is slightly superior to high protein meat meal, but that hens do not drink sufficient liquid buttermilk to meet their protein requirements when both milk and water are allowed.

[Poultry feeding experiments at the Mississippi Station], E. P. CLAYTON (*Mississippi Sta. Rpt. 1924, pp. 14, 15*).—In an experiment in which pedigreed pullets were compared with nonpedigreed pullets as layers, it was found that the four pens of 15 pedigreed pullets each laid a total of 4,494 eggs in 7 months as compared with 4,379 eggs laid in the same time by an equal number of nonpedigreed pullets.

In a test of several proteins for egg production, 7 pens of 15 White Leghorn pullets were given a basal ration of corn meal, wheat bran, and wheat shorts, with supplements in the different pens of beef scrap and cottonseed meal, beef scrap, shrimp meal, cottonseed meal and ground lime, beef scrap and ground lime, shrimp meal and ground lime, and ground lime. During 7 months the pens ranked in the order of production as follows: Beef scrap and cottonseed meal, beef scrap alone, shrimp meal and lime, and lime alone.

In connection with this experiment it was pointed out that all 7 pens had runways sodded in Bermuda and Paspalum grasses. It is also noted that the grass was fresh in these runways except in those receiving shrimp meal and beef scrap, where the grass was all dead.

A study of the winter egg production as compared with the annual production showed that pullets that laid 60 eggs or over during the 4 winter months usually laid over 200 eggs during the year.

[Yeast feeding for poultry at the North Dakota Station], O. A. BARTON (*North Dakota Sta. Bul. 194 (1926), p. 76*).—Chicks fed on a standard chick ration grew faster, laid younger, laid more and larger eggs, and the hens averaged heavier than those fed on rations in which either dry or wet yeast was used as a substitute for or a supplement to animal protein in baby chick feeding.

Cockerels fed out for market on a wet mash ration during an 8-day confinement period made greater daily gains on rations to which wet yeast was added than on the standard ration or when supplemented with dry yeast.

Some factors affecting the weight of eggs, H. ATWOOD (*West Virginia Sta. Bul. 201 (1926), pp. 31*).—This bulletin discusses the effect of various methods of feeding and other conditions on the weights of the eggs laid by the flocks of Single Comb White Leghorns previously described (E. S. R., 53, p. 671). The mean weights of the eggs laid by the individual birds of the flocks A, B, C, D, E, and F are tabulated. The records were for 3 years on the first two flocks, 2 years on the third and fourth, and 1 year on the fifth and sixth. Flocks A, C, and E were from the same origin and were fed liberal amounts of sour milk during growth, while the other flocks were successive generations which received limited amounts of sour milk. Certain of the data dealing with the mean weights and variability of the eggs laid by the different flocks have been reported in the previous publications.

In general the number of eggs laid per bird varied from 40 to 214 a year and the mean egg weight of individual birds varied from 42.27±0.18 gm. to 64.65±0.17 gm. Age was shown to be an important factor in influencing egg size in both types of feeding, the average weight of the pullets' eggs being 51.17±0.13 gm. as compared with 55.62±0.23 gm. and 56.41±0.30 gm., the weights of the eggs laid by the 2- and 3-year-old birds, respectively. The number of eggs produced did not appear to affect the size of the eggs, though

the limited sour milk feeding tended to increase the variability during the pullet year.

Studies of the weights of the eggs laid by individual birds showed that the egg weight of most individuals remains fairly constant except for a slight increase with age.

In two experiments, the withholding of mash and feeding grain only resulted in a decrease in the number of eggs produced, and the weight of the eggs was reduced more than 12 per cent in the first experiment and similarly in the second.

Studies of the weights of the eggs laid in individual cycles showed that the first egg of the cycle was usually heavier, but the amount of decrease during the cycle varied with the rate of production, i. e., the difference between the weights of the eggs in the cycle as compared with the first egg was smallest with high producers. The effect of the cycle on egg weight was also associated with the season.

The mean weight of the eggs laid by sisters did not show a significantly different departure from the mean weight of the eggs of the family than was shown by the weights of eggs laid by birds chosen at random, from which it is concluded that mere selection of dams for egg weight will not certify the production of daughters which will lay eggs of the desired weight.

DAIRY FARMING—DAIRYING

[Experiments with dairy cattle at the Iowa Station] (*Iowa Sta. Rpt. 1925, pp. 26–29, 60, 61*).—The results of feeding experiments with dairy cattle, mainly in continuation of those previously noted (E. S. R., 53, p. 779), are briefly reported.

Minerals for dairy cows.—For studying the effects of various minerals on dairy cattle the entire station herd was divided into two groups, one of which received mineral supplements, while the other group received no minerals in addition to those in the feeds composing the ration. So far the experiment has been continued through the pasture season and the winter season of 1924–25. The minerals included in the experiment consisted of steamed bone meal, raw bone meal, acid phosphate, limestone, and spent bone black. A marked preference has been shown for the bone meals as compared with the other supplements, but so far no difference in the effects on the animals has been noted in the group receiving minerals as compared with the group receiving no supplemental minerals.

Soy beans with corn for silage.—In continuing this trial from the previous year three types of silages were compared, i. e., corn silage, corn-soy bean silage containing 3.4 per cent soy beans, and corn-soy bean silage containing 25 per cent soy beans. The results of the two tests are in general agreement. All three types of silage compared were apparently equal in quality and palatability, but corn silage was superior to both the other types for butterfat production, while the mixture containing the smaller amount of soy beans was slightly superior for milk production. The differences observed were very small. In view of this fact and since corn silage was produced at a slightly less cost per ton it is recommended that dairymen in the Corn Belt use corn alone for silage.

Summer silage.—The combined results of two tests of the value of feeding corn silage with summer pasture, conducted in 1923–24, have indicated that such feeding results give an increased milk and butterfat production which is not entirely offset by the additional feed and labor required. The improved

physical condition of the cows prepares them better for succeeding lactations, which appears to justify the method of feeding.

Arkansas dairy cattle improvement project.—A total of 20 granddaughters have now been produced from the original scrub cows mated with purebred sires in this experiment. Their average yearly milk and fat production has been nearly 40 per cent greater than that of their dams, which was in turn approximately 40 per cent greater than that of their granddams. The greatest improvement in type has become apparent in the second generation of breeding to purebred sires.

Economy and efficiency of the milking machine.—A preliminary investigation of milking machines as labor-saving devices and especially with reference to their influence on bacterial contamination and dirt in the milk has indicated that efficient use of the milking machine is a means of saving considerable time. Cleanliness of the milk depended upon the efficiency of the operator, but the bacterial content of the milk produced in either hand or machine milking was not proportioned to the amount of sediment present. Steam alone did not sufficiently sterilize the milking parts of mechanical milkers.

[Feeding experiments with dairy cattle at the North Dakota Station], J. R. DICE (*North Dakota Sta. Bul. 194 (1926), pp. 55–57*).—The following experiments deal with the comparison of different feeds for milk production:

Home-grown feed.—In a 10-day period 6 cows produced 80.19 lbs. of butterfat on a ration of alfalfa hay, corn silage, and a grain mixture of barley, oats, and corn. During a 10-day period on the same ration, except that silage was replaced by corn fodder, the cows produced 69.63 lbs. of butterfat, and when the corn fodder was replaced by prairie hay 65.03 lbs. of butterfat were produced. When again fed alfalfa and corn silage, production was maintained.

In another trial cows receiving corn fodder and prairie hay as roughage required 1.495 lbs. of digestible nutrients per pound of milk produced, while another group receiving alfalfa hay and corn silage required 0.935 lb. of digestible nutrients per pound of milk. Gains in live weight were also greater on the alfalfa hay and corn silage ration.

Potatoes for dairy cows.—Nine cows were fed during a 10-day period with corn silage as the succulent part of the ration, followed by 10-day periods in which potatoes and then silage were fed as supplements. When feeding potatoes 7.6 per cent more digestible nutrients were required for milk production and 3.9 per cent more for butterfat production than when corn silage was fed. It is concluded from the experiment that while potatoes are not as palatable as corn silage they are nearly as valuable for milch cows.

Sweet clover silage made in stacks.—In this test it was found that cows on pasture would not eat such silage in any considerable amounts, but when off pasture it was well eaten as a substitute for corn silage.

Influence of feeds on the flavor of milk and butterfat.—In feeding trials in which potatoes were fed immediately after milking, no influence on the flavor of the milk or butterfat was apparent. Further tests indicated that green sweet clover eaten just before milking may cause an unsatisfactory flavor, but that if the cows are turned on pasture in the morning they will fill up sufficiently before evening so that there will be no effect on the milk. Similar results were obtained with studies of sweet clover silage, though no trouble has been experienced from the feeding of sweet clover hay.

[Soy bean products for dairy cattle], E. BRINTNALL (*Mississippi Sta. Rpt. 1924, pp. 16, 17*).—In these studies it has been found that soy bean hay is equally as good as alfalfa hay for milk production, while ground soy beans increased the fat percentage and produced more total butterfat than cottonseed meal when fed with Johnson grass hay. Soy bean oil meal maintained

the milk flow equally as well as cottonseed meal, and the amount of butterfat was slightly increased.

Soybean hay for milk production, S. I. BECHDEL (*Pennsylvania Sta. Bul. 201 (1926), pp. 16, fig. 1*).—The results of the three tests of the comparative value of soy bean hay and alfalfa hay for milk production are given in greater detail than in the annual report previously noted (E. S. R., 54, p. 373).

The combined results of the three trials have shown that soy bean hays of poor or medium quality are inferior to alfalfa hay in feeding value, but that soy bean hay of very high quality is slightly superior to alfalfa hay.

Feeding minerals to dairy cattle, O. E. REED and C. F. HUFFMAN (*Michigan Sta. Circ. 195 (1926), pp. 14, figs. 6*).—Essentially noted from another source (E. S. R., 53, p. 379).

Body form and production [trans. title], DRIEHAUS (*Arb. Lüneburger Herdbuchgesell. No. 2 (1925), pp. 44, pls. 3, figs. 15*).—This is a report of a study of the records of the Lüneburg Cow Testing Association for the years 1905 to 1924.[3]

A quarter century of herd improvement, H. GROH (*Sci. Agr., 6 (1926), No. 8, pp. 280–282, fig. 1*).—The progressive improvement which has occurred in the first year's production of Holstein heifers on the author's farm during 25 years is charted.

Recent investigations of dairy problems, H. H. DEAN (*Ontario Dept. Agr., Agr. and Expt. Union Ann. Rpt., 47 (1925), pp. 37, 38*).—The results of various investigations are reported very briefly.

No injury to the milk for direct consumption or for the manufacture of butter or cheese was noted from sweet clover pasture or from sweet clover silage.

Tests of the acidity of milk showed that when the milk was drawn from the cow the acidity ranged from 0.11 to 0.225 per cent. One cow produced milk containing 0.2 per cent acid in 8 of 11 tests. The average of the entire herd was 0.15 per cent during February and March, with an increase to 0.166 per cent in 48 hours when held at 40 to 50° F., but this milk developed 0.23 per cent acid in 24 hours when held at 60 to 70°. Milk testing high in acid was found to produce cream which was very high in its acid content.

The principles of a rational technique in the dairy industry [trans. title], G. GUITTONNEAU (*Lait, 3 (1923), Nos. 9, pp. 669–689; 10, pp. 782–797; 4 (1924), Nos. 31, pp. 14–29; 32, pp. 108–124; 33, pp. 209–219*).—This deals briefly with the more common practices of handling milk and the manufacture of dairy products, with special reference to the favorable and unfavorable rôle played by bacteria.

On lactic acid fermentation, II [trans. title], A. I. VIRTANEN, H. KARSTRÖM, and R. BÄCK (*Hoppe-Seyler's Ztschr. Physiol. Chem., 151 (1926), No. 4–6, pp. 232–241*).—In continuing this series (E. S. R., 53, p. 474) solutions of 0.1 to 1 per cent of glycerin aldehyde, dioxyacetone, methylglyoxal, and pyroracemic acid in nutrient bouillon were inoculated with cultures of *Streptococcus lactis* and *Bacillus casei* ε to determine the ability of the lactic acid bacteria to break down these substances. Negative results were obtained. Dry preparations of the bacteria were also unable to produce lactic acid from these substances. The lactic acid bacteria did not appear to contain carboxylase, and the lactic acid fermentation of glucose was not influenced by the presence of calcium sulfite.

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[3] Arb. Lüneburger Herdbuchgesell. No. 3 (1925), pp. 89.

The bacteriological examination of milk from Breconshire and Radnorshire, D. M. Evans and R. O. Davies (*Welsh Jour. Agr., 2 (1926), pp. 168–180*).—The amount of dirt, bacterial content, contamination with *Bacillus coli*, keeping quality, methylene blue reduction test, and the relation of various conditions to the bacterial content were determined at 14-day intervals in the milk from 11 different dairies in a clean milk competition.

The studies of the keeping quality show that the morning's milk possessed better keeping qualities, although it also contained more bacteria per cubic centimeter, due to the differences in the temperatures and the time over which the morning and evening milk was held.

Much difference was found in the bacterial counts of the samples from the dairies and the samples of ordinary retail milk, the latter containing an average of over 100 times the count of the former samples. All of the retail samples contained *B. coli*, and in 80 per cent they were present in 0.001 cc. *B. coli* were absent from many or present in only a very small proportion of the farm samples.

Where the milking utensils were steamed there was greater freedom from *B. coli* and longer keeping quality, although the bacterial content was not as low as where the utensils were boiled or scalded. The methods of feeding and the use of small top pails for milking as compared with large top pails were found to affect the bacterial content materially.

Clean milk, its relation to profitable dairying, R. C. Fisher (*Conn. Agr. Col. Ext. Bul. 92 (1925), pp. 16, figs. 8*).—Popular directions for clean milk production.

The present status of milk pasteurization in Minnesota, H. A. Whittaker and R. W. Archibald (*Minneapolis: Minn. State Bd. Health, Div. Sanit., 1925, pp. 4*).—Largely a summary of the requirements of the Minnesota State Board of Health.

An apparatus for sterilizing milk bottles at small milk plants and dairies, H. A. Whittaker and R. W. Archibald (*[Minneapolis]: Minn. State Bd. Health, Div. Sanit., 1924, pp. 15, figs. 6*).—A description and diagrams are given of an apparatus constructed for sterilizing milk bottles in chlorine solutions. The apparatus consists of a wood cylinder with 8 rows of wooden pegs to allow one milk bottle to be placed on each and rotated into the solution. A test of the efficiency of the apparatus showed that milk bottles cleaned in the ordinary way contained from 66,000 to 8,400,000 bacteria, while those cleaned with the apparatus described contained from 0 to 1,000 bacteria per bottle.

The influence of different methods of cleansing dairy utensils on the bacterial content of churns and on the keeping properties of milk, F. Procter and W. A. Hoy (*Jour. Hyg. [London], 24 (1925), No. 3–4, pp. 419–426*).—The first portion of this paper gives the results of the effect of different methods of cleaning 10- and 17-gal. milk cans on the bacterial content. Sour milk was allowed to stand in the cans for 2 days, after which they were carefully washed and drained. The lids were then placed on the cans, while others were scalded with boiling water and others with steam until unbearably hot to the touch or from 1 or 5 minutes thereafter. The temperature of the boiling water used for scalding dropped from 11 to 17° F. during transfer to the cans. Bacterial counts were determined by plating from sterile water rinsings of the cans after the latter had stood for 1 day. Bacterial counts as high as 36,900,000 were obtained from the cans which had been washed only. The highest count obtained after scalding was 6,920,000, but all other counts were under 10,000 per cubic centimeter. The numbers in the steam sterilized cans were very small.

The second part of the paper gives tests of the keeping quality of milk inoculated with some of the water used for rinsing the cans. These results showed that the control samples and the milk inoculated from the rinse water from the steam sterilized cans required from 2.5 to 3.5 days to sour, while the milk inoculated from the scalded cans soured in 1.5 to 2 days and that from the cans which were only washed soured in 1 to 1.5 days. The authors recommend that efficient sterilization should not leave more than 5 bacteria per cubic centimeter to be added to the milk, as contrasted with the recommendation of 100 bacteria per cubic centimeter suggested by Prucha and Harding (E. S. R., 52, p. 278).

Buttermaking on the farm, W. F. JONES (*Canada Dept. Agr. Bul. 57, n. ser. (1925), pp. 11, figs. 10*).—A revision of Bulletin 53 (E. S. R., 38, p. 580).

Storing butter on the farm, J. R. DICE (*North Dakota Sta. Bul. 194 (1926), pp. 57, 58*).—In tests of different methods butter from pasteurized cream scored higher at the end of the storage period than butter made from unpasteurized cream. When the butter was stored in a saturated solution of salt it scored higher than when stored in small stone jars or in self-sealer glass fruit jars.

Effect of carbon dioxide on quality and keeping quality of butter and ice cream (*Iowa Sta. Rpt. 1925, p. 42*).—Studies of the effect of carbon dioxide on butter and ice cream were generally negative so far as keeping quality of the product was concerned and the inhibition of bacterial growth. Neither product retained appreciable quantities of carbon dioxide.

The relation of several ingredients to the manufacture of commercial ice cream, W. H. E. REID (*Missouri Sta. Circ. 148 (1926), pp. 4*).—This publication presents some practical applications of the results of investigations noted (E. S. R., 52, p. 679; 53, pp. 76, 77).

VETERINARY MEDICINE

Special pathology and therapeutics of the diseases of domestic animals, F. HUTYRA and J. MAREK, edited by J. R. MOHLER and A. EICHHORN (*Chicago: Alexander Eger, 1926, 3. Amer. ed., rev. and enl., vols. 1, pp. XVI+1091, pls. 19, figs. 259; 2, pp. VIII+850, pls. 3, figs. 165; 3, pp. VII+835, pls. 6, figs. 185*).—This third English edition, of which the second has been noted (E. S. R., 36, p. 477), is a translation of the sixth German edition (E. S. R., 51, p. 678), which because of the increase of material is issued in three volumes.

The first volume, embracing exclusively the infections diseases, was prepared by Hutyra. It includes new accounts of paratyphoid and Texas fever. Among the revisions made necessary by recent investigations are accounts of the etiology of malignant edema, ulcerative and epizootic lymphangitis, infectious abortion, septicemias of fowl, joint-ill of foals, the treatment of foot-and-mouth disease with blood, the data on diagnostic methods especially in pleuropneumonia, glanders, and dourine, the various protective inoculations, etc.

The second and third volumes, which deal with the organic diseases, were prepared by Marek. New information is given in the second volume on acetonemia of cattle, dochmiasis of silver fox, intestinal coccidiosis of swine and guinea pigs, sequelae of foot-and-mouth disease, etc. In the third volume information is added on exhaustion, lamziekte, encephalitis lethargica, louping ill of sheep, feeding polyneuritis, yellow thick-head (dickkopf) of sheep and goats, etc. Many of the chapters have been either entirely or partly revised and elaborated. In all three volumes the diseases occurring outside of Europe and the tropical diseases were given due consideration according to their importance.

In revising the work the literature was consulted up to the year 1921 and to some extent even after that. References to such literature, which were included in the first two English editions, are omitted from this third edition.

The number of text illustrations, some of which are colored, were increased from 490 to 618 and the colored plates from 21 to 28. A separate index has been prepared for each volume. Statistical data and other information pertaining to diseases occurring in the United States have been brought up to date through appropriate additions by the editors.

The translators of the first volume are J. R. Mohler, A. Eichhorn, P. Fischer, and H. J. Achard; of the second volume, M. Herzog, A. L. Sheather, G. Mayall, and H. Schmidt; and, of the third volume, M. Herzog, A. L. Sheather, G. Mayall, and H. J. Washburn.

Report of the New York State Veterinary College at Cornell University for the year 1924–1925 (*N. Y. State Vet. Col. Rpt. 1924–25, pp. 238, pls. 23, figs. 20*).—This report includes the following papers: Vital Statistics of Diseases of the Genital Organs of Cows, by D. H. Udall, E. R. Cushing, and M. G. Fincher (pp. 52–66); Prevention of Diseases of Newborn Calves, by D. H. Udall (pp. 67–78); Studies of Genital Disease in a Herd of Dairy Cattle, by M. G. Fincher (pp. 79–99); The Channel of Invasion of *Bacterium abortum* with Special Reference to Ingestion, by R. R. Birch and H. L. Gilman (pp. 100–126); A Mould Associated with Abortion in Cattle, by H. L. Gilman and R. R. Birch (pp. 127–133); Some Common Diseases of Dogs, by H. J. Milks (pp. 134–145); Bracken Poisoning of Cattle (pp. 146–151) and The Green Coloration Produced by Certain Streptococci on Blood Agar Plates (pp. 152–162), both by W. A. Hagan; Arteriosclerosis in Domestic Animals, by S. A. Goldberg (pp. 163–172); A Clinical and Pathological Study of the Nervous Form of Canine Distemper, by S. A. Goldberg and R. H. Volgenau (pp. 173–189); A Study of Skin Tuberculosis, by C. M. Carpenter and S. A. Goldberg (pp. 190–196); Further Observations on the Blood and Urine of the Horse in Azoturia (E. S. R., 52, p. 684) (pp. 197–199) and the Blood and Urine of the Cow in Milk Fever.—A Second Report (E. S. R., 55, p. 371) (pp. 200–205), both by C. E. Hayden; Case Report Illustrating the Value of the X-Ray in Diagnosis, by E. M. Curley (pp. 206–208); Fowl Plague, by E. L. Brunett and S. Kondo (pp. 209–224); and Immunizing Young Pigs Against Hog Cholera, III (E. S. R., 55, p. 371) (pp. 225–230) and Experiments with Mixtures of Anti-Hog Cholera Serum and Hog Cholera Virus (pp. 231–235), both by J. W. Benner.

[Veterinary work at the North Dakota Station], A. F. SCHALK (*North Dakota Sta. Bul. 194 (1926), pp. 90–95, fig. 1*).—The first part of this report (pp. 90–93) deals with avian tuberculosis experiments, conducted both outside in an experimental cage barnyard, and inside in controlled box stalls. Two to 5 small caseous or slightly calcareous foci were found in 5 mesenteric lymph nodes of a colt kept in the cage barnyard with tuberculous chickens, and 6 of 7 calves kept under the same conditions reacted positively to avian tuberculin.

Of 93 pigeons kept with tuberculous chickens in the cage barnyard for from 4 to 6 months, 13 showed typical tuberculosis lesions, and 9 exhibited lesions strongly simulating miliary tubercles, which proved negative to tubercle germs on microscopic examination. Post-mortem examinations of 35 sparrows kept for 4 months under similar conditions showed no evidence of tuberculosis. It is pointed out that there is no dependable test for tuberculosis in sparrows or pigeons, and resort was made to post-mortem examinations. Three of 49 chickens ranging from 4 weeks to 4 months of age that were kept in the cage barnyard with diseased chickens for 6- to 10-week periods showed tuberculosis lesions. Three of 4 healthy short yearling calves kept in box stalls and given fresh droppings from tuberculosis reacting fowls, 2 for 2 months and 2 for 5 months, reacted positively with avian tuberculin but negatively with bovine tuberculin. Thirty pigeons were confined in a box stall with 19 reacting tuberculosis chickens for 10 months, at the end of which time 21 remained and were

killed, of which 5 were visibly infected with tuberculosis and 1 showed acid fast bacilli resembling tuberculosis germs upon microscopic examination. Thirty pigeons were confined in a box stall with 21 reacting tuberculosis chickens and 2 pigeons died with generalized tuberculosis. At the end of 6 months the tuberculous chickens were removed, the stall carefully cleaned and disinfected, and 16 healthy chickens were placed with the remaining 28 pigeons for 7 months. At the end of 3 months 1 chicken reacted to the tuberculin test, at the end of 6 months none reacted, and at autopsy all chickens were free from visible lesions of tuberculosis.

In feeding experiments with barn mice, field mice, and common rats, none became infected with avian tuberculosis. One cage of common rats was given intraperitoneal inoculations of suspensions of tuberculous lesions from the livers and spleens of tuberculosis chickens, and rats in another cage were given intracardial inoculations of suspensions of tuberculous lesions from the infected livers and spleens of tuberculosis chickens. When autopsied after 3 months none of the rats showed any evidence of tuberculosis infection. The control and possible eradication of avian tuberculosis from farm flocks are briefly considered.

A brief report is made on work with damaged or spoiled sweet-clover hay and silage disease in cattle (pp. 94, 95), a circular upon which, by Schalk, has been noted (E. S. R., 54, p. 775). Reference is also made to studies of coccidiosis in cattle and enterohepatitis or blackhead in turkeys.

A comparison of strains of Brucella abortus isolated from man with those from cattle, C. M. Carpenter (*Jour. Infect. Diseases, 39 (1926), No. 3, pp. 215–219; abs. in Amer. Jour. Path., 2 (1926), No. 5, pp. 455, 456*).—In investigations conducted at the New York State Veterinary College, at Cornell University, the first generation of cultures of *B. abortus* isolated from man was difficult to cultivate, but the second and following generations have grown well on nutrient agar in unsealed tubes.

"The human strains have proven highly virulent for guinea pigs, but not more virulent than certain bovine strains with which the author has worked. Four of the strains have produced lesions in guinea pigs which could not be distinguished from lesions produced by virulent types isolated from milk, placenta, and bovine fetus. Abortion was produced in five pregnant heifers by the intravenous injection respectively of five strains of human source. The organism was recovered from the colostral milk, placenta, and fetus. The infection established itself in the udder and was present in the milk of one case for 6.5 months after the animal aborted. The cultures isolated from man were more toxic for the pregnant heifers than the bovine types and produced abortion in a shorter time than have bovine strains as reported by other observers."

Undulant fever in man associated with bacteria indistinguishable from Brucella abortus, V. A. Moore and C. M. Carpenter (*Cornell Vet., 16 (1926), No. 2, pp. 147–152; abs. in Amer. Jour. Path., 2 (1926), No. 5, p. 455*).—The authors briefly review cases of human infection with this organism, first reported by Keefer (E. S. R., 50, p. 684), and consider six cases of undulant fever in which *B. abortus* was isolated from the blood.

Abortion was produced in pregnant heifers with cultures isolated from four of the six cases. The inoculation produced a more severe reaction in cattle than usually follows the injection of *B. abortus* isolated from infected cows. While the source of infection in the human cases reported was not determined, two were known to have drank freely of raw milk from infected herds. One case had three consecutive attacks, each lasting about 10 days, interspersed with periods of about the same time. A second was an atypical case of typhoid

fever from which both *B. abortus* and *Bacillus typhosus* were recovered. A third case was tentatively diagnosed as typhoid fever, later miliary tuberculosis was suspected, and a third diagnosis of malaria was suggested. The disease ran a course of about 12 weeks, when recovery followed. A fourth case was that of a young man suffering from reddish, edematous spots on his legs, an undulating fever, and general malaise, who recovered in about 6 weeks. In a fifth case, that of a man 41 years of age, the disease proved fatal after a long illness, and the autopsy showed a chronic, septic splenomegaly.

Agglutinins for Brucella abortus in the blood of man, C. M. Carpenter (*Jour. Infect. Diseases, 39 (1926), No. 3, pp. 220–223*).—In the course of studies of 20 cases of undiagnosed fevers by the author during the last year, cultures were made and guinea pigs were given injections with the blood and, in many instances, with the urine from each of the patients. Agglutination tests with the abortus antigen were made, and with those serums in which agglutination occurred, with one exception, agglutinin absorption tests were made to determine their specificity. The serums from 4 of 20 patients showing symptoms suggestive of undulant fever contained specific agglutinins for *B. abortus*. The serum from a fifth patient who showed typical symptoms of recurrent or undulant fever agglutinated the abortus antigen completely in a dilution of 1:120. The author was unable to obtain sufficient serum for an agglutinin absorption test. *B. abortus* was isolated from the blood of 5 of the 20 patients. In the blood serums of 2 of these no abortus agglutinins could be demonstrated. However, one serum contained agglutinins for typhoid bacilli, while the other gave a 4+ Wassermann reaction. The titer of the serums varied from 1:30 to 1:480.

In the light of these findings it is concluded that the agglutination test can not be relied on to detect the presence of *B. abortus* in man.

Human infection with Brucella melitensis, variety abortus, treated with mercurochrome, E. E. Gage and D. A. Gregory (*Jour. Amer. Med. Assoc., 87 (1926), No. 11, pp. 848, 849*).—The authors report upon a case of infection with *B. melitensis abortus* in man (E. S. R., 50, p. 684). The case occurred in South Dakota. Investigation showed that the patient had worked only in a hog-killing department for the past five years, and this is thought to have been the source of infection.

Brucella abortus in udders of vaccinated and naturally infected cattle, C. M. Carpenter (*Cornell Vet., 16 (1926), No. 2, pp. 133–136*).—The author reports that agglutinins for *B. abortus* were present in the blood serum of 86 per cent of a group of animals which had been injected subcutaneously at least three times, before three gestation periods, respectively, with 10 cc. of a living suspension of the Bang organism, and that 24 per cent of this group aborted. *B. abortus* was recovered from the milk of 38 per cent of the animals. In a second group of cows which had either aborted or had retained placenta at least once during three gestation periods previous to the examination of the blood, and in which no vaccination had been practiced, agglutinins for *B. abortus* were present in the blood serum of 72 per cent and in the milk of 66 per cent of the animals which showed clinical evidence of genital disease.

The diagnosis of infectious abortion with special reference to agglutinating limits, F. P. Mathews (*Jour. Amer. Vet. Med. Assoc., 69 (1926), No. 5, pp. 613–621, figs. 2*).—This is a contribution from the Indiana Experiment Station, in which 942 samples of sera collected from 264 animals were tested with the agglutination and complement-fixation tests. The results show a negligible advantage in favor of the agglutination test.

"*A[lcaligines] abortus* was isolated by guinea-pig inoculation with greater regularity than by direct isolation. *A. abortus* was not isolated from animals that aborted but failed to react. The causative factor in 21 cases of abortion occurring in a purebred herd could not be determined. It was possible to divide the reacting animals into two groups according to the curves established by the agglutinating limits of their sera. The curves for the animals of group 1 showed no appreciable decline over a long period. The curves for animals of group 2 showed a gradual decline which began a few months after infection with *A. abortus*. Eight animals of this group ceased to react during the period of investigation. The elimination of *A. abortus* at the time of parturition was confined to group 1."

Rabies—hydrophobia—dog madness, R. R. Dykstra, H. F. Lienhardt, and E. J. Frick (*Kansas Sta. Circ. 126 (1926), pp. 6*).—A practical summary of information on this disease of the dog.

[**Studies of the Salmonella group**] (*[Gt. Brit.] Med. Research Council Spec. Rpt. Ser. Nos. 91 (1925), pp. 159; 92 (1925), pp. 112, figs. 2; 103 (1926), pp. 160, pl. 1, figs. 2*).—The reports thus far issued are as follows:

No. 91. *An investigation of the Salmonella group, with special reference to food poisoning*, W. G. Savage and P. B. White.—This report deals with the identification and classification of organisms of the Salmonella group, their distribution in nature, and the effects produced in animals by Salmonella infections, the serological classification of the various bacilli being by White and the other parts of the report by Savage and White.

No. 92. *Food poisoning: A study of 100 recent outbreaks*, W. G. Savage and P. B. White.—The results of a detailed investigation, epidemiological and bacteriological, of 100 actual recent outbreaks of food poisoning in England are here described.

No. 103. *Further studies of the Salmonella group*, P. B. White.—In this supplement to Special Report No. 91, the serological studies there dealt with are extended and carried into greater detail and two more original lines of investigations are included, namely, (1) a study of the antigenic modifications associated with "rough" variation in this group, and (2) an attempt to determine the relative antigenic constitutions of several Salmonella types. These are here dealt with as follows: (1) Studies of the classification and distribution of the Salmonella group (pp. 7–39), (2) serological variation in the Salmonella group (pp. 39–87), (3) further observations on the antigenic structure and relationships of the Salmonella types (pp. 88–126), (4) the relative antigenic structures of the types of the Salmonella series (pp. 126–136), and (5) the phylogeny and classification of the Salmonella group (pp. 136–158). A list of 54 references is included.

On a piroplasmosis-like disease of cattle in Sapporo and its neighborhood [trans. title], C. Kohanawa and K. Ogura (*Jour. Japan. Soc. Vet. Sci., 4 (1925), No. 3, pp. 301–328, pls. 2, figs. 5*).—The authors report upon investigations which have been made for several years of a piroplasmosis-like disease of cattle, known as tick fever, which chiefly attacks pastured cattle. It is an epidemic disease, occurring in summer, and analogous in type to piroplasmosis. The form of piroplasmosis has not been determined, since it coincides with neither Texas fever nor coast fever. It resembles the former in symptoms, but the Piroplasmas in the blood of the diseased animals are quite different in form. The disease differs from coast fever in symptoms, but the parasitic Piroplasmas morphologically resemble each other very closely. It was often found that healthy cattle had rather more parasites in the blood than the diseased animals. The inoculation of healthy cattle with the blood

of infected ones showed that the transmission of Piroplasma and the invasion of the disease do not go hand in hand.

Sore mouth in lambs and other forms of necrobacillosis in sheep, H. WELCH (*Montana Sta. Bul. 186 (1926), pp. 16, figs. 7*).—This is a practical account of the infections due to the necrosis bacillus.

A comparison of the blood of a normal and two castrated billy goats, P. A. FISH and C. E. HAYDEN (*Cornell Vet., 16 (1926), No. 2, pp. 82–87*).—The results of chemical examination and blood counts of one normal and two castrated goats are tabulated.

Breeding swine for natural resistance to cholera (*Iowa Sta. Rpt. 1925, pp. 46, 47*).—A brief statement of the progress of work under way.

Lice, mange, and ticks of horses, and methods of control and eradication, M. IMES (*U. S. Dept. Agr., Farmers' Bul. 1493 (1926), pp. II+22, figs. 13*).—This is a practical summary of information.

Poultry disease and pest control, O. A. BARTON (*North Dakota Sta. Bul. 194 (1926), pp. 75, 76*).—The author reports that the poultry flock has been tested each year for tuberculosis and all reactors destroyed, only very slight infection having been found after the third year. Mites were controlled by the use of kerosene and waste crank case oil.

Bacillary white diarrhea in chicks and Salmonella pullora infection in adult fowl, R. GWATKIN (*Ontario Vet. Col. Rpt. 1924, pp. 68–70, figs. 2*).—In reporting upon the prevalence of bacillary white diarrhea in Ontario, the author records the fact that 107 of the 179 young chicks received during the spring from various parts of the Province were infected with *S. pullora*. The findings in autopsies of adult fowls which succumbed to the disease are reported upon. In the first of two outbreaks of the disease in adult fowls, 15 of 93 birds in the flock succumbed, and a number of others were affected but recovered. Infection in this outbreak was evidently carried in the ovaries of infected hens, with the usual result of infected chicks and the unusual result of an outbreak among mature birds. In the second outbreak, which occurred in September, birds had been dying since July, and the flock was reduced through the disease by one-half. In the course of blood testing work, examinations were made of the ovaries of 60 hens that gave positive reactions, and *S. pullora* was recovered from 55.

Control of bacillary white diarrhoea, 1925–1926, P. E. BRANSFIELD (*Massachusetts Sta. Control Ser. Bul. 35 (1926), pp. 7*).—A tabulated report is given of the 1925–26 season's work on the control and eradication of bacillary white diarrhea in adult birds, in continuation of the work of the preceding years (E. S. R., 53, p. 889). During the season 67,919 birds were tested and 2.31 per cent of infection detected. One hundred and twenty-four flocks, representing 33,615 birds, were found to be free from the disease, as compared with 79 flocks and 25,390 birds the preceding year.

Bacillary white diarrhoea of chicks, T. M. DOYLE (*Jour. Min. Agr. [Gt. Brit.], 33 (1926), No. 6, pp. 517–526, pl. 1*).—This is a practical summary of information based upon investigations previously noted (E. S. R., 55, p. 74).

In discussing the agglutination test, it is pointed out that a certain interval must elapse between the bird becoming infected and giving a reaction to the test. In artificially infected birds this period is about six days, and it is probably somewhat longer under natural conditions. For this reason it is advisable to retest the flock after an interval of one month.

Bacillary white diarrhea of young chicks in Japan [trans. title], T. KONNO (*Jour. Japan. Soc. Vet. Sci., 4 (1925), No. 3, pp. 273–288, pl. 1*).—The author first observed the prevalence in Japan of this disease (commonly known as kiifun or ohri) in 1923 among young chicks from Nagoya and its neighborhood

and isolated *Bacterium pullorum* of the anaerogenic strain. Searching for the aerogenic strain of the organism in 1924, he met with several outbreaks and was able to isolate two types of *B. pullorum* from the dead chicks, one the anaerogenic and the other the aerogenic type, which he terms types A and B.

Avian hemorrhagic septicemia (fowl cholera), J. W. Patton (*Jour. Amer. Vet. Med. Assoc., 68 (1926), No. 5, pp. 581–602, figs. 4*).—This is an extended account of studies of this disease in Massachusetts, with references to the literature.

Tests of the De Blieck-Van Heelsbergen method of immunisation against fowl pox, T. M. Doyle (*Vet. Rec., 6 (1926), No. 34, pp. 741–743*).—In this report of tests of antidiphtherin, a biological product recently introduced by De Blieck and Van Heelsbergen (E. S. R., 53, p. 785) for immunizing against diphtheria and fowl pox, it was found that the virus contained in different samples is not uniformly attenuated. It may be very weak or dead, and in either state confers no immunity, or it may be an active virus which confers a good immunity but gives rise to secondary lesions and loss of condition in many of the inoculated birds. Crusts falling from the inoculated area were found to contaminate the ground. It is pointed out that antidiphtherin should be employed only for the inoculation of infected flocks.

AGRICULTURAL ENGINEERING

National agricultural engineering research, R. W. Trullinger (*Agr. Engin., 7 (1926), No. 2, pp. 59–63*).—In a contribution from the U. S. D. A. Office of Experiment Stations national agricultural engineering research is defined, and existing investigational activities are analyzed in an effort to show how it may be recognized. The subjects of land clearing, machinery, structures, power, drainage, irrigation, soil erosion, materials of construction, and water supply, sewage disposal, and sanitation are discussed, with particular reference to the projects of research now in force on these subjects at the experiment stations.

The conclusion is drawn that there is a well-defined need for some original fundamental research to establish certain broadly applicable agricultural engineering principles. Much of the work of a purely local character has apparently reached a point beyond which it can not proceed without further fundamental knowledge. In nearly every case also the necessity for cooperation with specialists in agricultural science is evident. It is considered unnecessary to search for or create new opportunities to do national research in agricultural engineering, since such opportunities apparently already exist in quite considerable number.

[Agricultural engineering studies at the Iowa Station] (*Iowa Sta. Rpt. 1925, pp. 10–12*).—Experiments on masonry water tanks indicated that it is entirely practicable to build satisfactory farm water supply tanks of masonry and to utilize the silo as a tower without in any way interfering with its use as a silo.

Experiments on the weathering tests of prepared roofing have indicated again (E. S. R., 53, p. 788) that the action of the sun is one of the most destructive agencies, and that a mineral surface of crushed slate, sand, mica, or asbestos seems to contribute greatly to the durability.

Tests of an aeroelectric plant indicate that the plant would furnish an adequate amount of electricity for lighting purposes and for supplying small motors about the home.

Studies of the horse as a motor have shown that it is possible for a horse to exert a tractive pull of more than his weight, and that the ability of horses to pull depends upon their strength and the available footing. However, the

ability of the driver and the training of the horse are all-important features in securing a maximum effort. It has been found that a horse at continuous work can exert a tractive pull of one-tenth of his weight while traveling 20 miles each day without intense fatigue except when it is extremely hot and humid. Keeping the shoulders of the horse in condition is considered to be probably the greatest problem for horses required to give severe continuous service. A significant feature of the horse as a motor is the overload capacity for a short period, running as high as 1,000 per cent for a short pull of 10 seconds.

Physics in agriculture, B. A. Keen (*Nature [London], 116 (1925), No. 2929, pp. 905–907, figs. 2*).—A brief review of some of the work in soil physics in progress at the Rothamsted Experimental Station is presented, special attention being drawn to the work on the draft of tillage machinery.

Industrial water supplies of Ohio, C. W. Foulk (*Ohio Geol. Survey, 4. ser., Bul. 29 (1925), pp. 406*).—The purpose of this bulletin is to present by chemical analyses the nature of the waters of Ohio, and to give some account and discussion of water problems, such as the source and character of the impurities, the methods of water analysis, the behavior of water in use, and the purification of water for industrial purposes. The bulletin is in three parts. Part 1 contains general information about water and its behavior in use, and contains chapters on origin of the impurities in water; meaning of water analysis; ways of stating the results of a water analysis; calculating hypothetical combinations; methods of chemical analysis; interpretation of industrial water analysis; hardness and water in the household; scale, boiler compounds, and internal treatment; corrosion; foaming and priming; and purification of water for industrial use. Parts 2 and 3 deal, respectively, with the chemical character of the surface waters and the ground waters of Ohio.

The rate of atmospheric reaeration of sewage-polluted streams, H. W. Streeter (*Pub. Health Rpts. [U. S.], 41 (1926), No. 7, pp. 247–262, figs. 7*).—Studies are reported which indicate that the reaeration of flowing streams proceeds substantially in accordance with certain physical laws. Its rate at any time is controlled mainly by the temperature, turbulence, and oxygen saturation deficit of the stream. An empirical method of measuring rates of reaeration is described, which involves the use of the resultant oxygen equation and the substitution therein of quantities derived by observations in the stream under proper circumstances. This equation has been found to give results which appear to be consistent with known facts concerning the physical conditions influencing such rates.

Soil structure, its determination as the relation of capillary to noncapillary porosity, and its importance as a productiveness factor [trans. title], A. G. Doĭarenko (Dojarenko) (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 1 (1924), No. 7–8, pp. 451–474, figs. 8*).—Studies conducted at the Moscow Agricultural Academy are reported which led to the conclusion that only certain determinate physical and mechanical properties of the soil complex should be considered in the investigation and evaluation of soil structure. The capillary and noncapillary porosities of soils, and especially their ratio, were found to have the greatest influence on the factors governing soil structure of any of the dynamic properties of soils.

The presence of both types of porosity in soils was found to have a definite influence on permeability to air and water, water capacity, capillary rise, evaporation, ratio of water to air, biological activity, accumulation of soluble nutrients, concentration of soil solution, degree of dissociation, H-ion concentration, and gaseous exchange.

It is concluded that the extreme variability of the soil structure is due to the two properties of capillary and noncapillary porosity, and that individual

structures such as single grain, crumb, or clod structures represent special values of the ratio of the two types of porosity. This ratio on the volume basis is termed the porosity factor of soil.

A fixed and uniform correlation was established between the porosity factor of a fractionated soil and its productiveness factors. The same correlation was established for soil not fractionated. The optimum porosity factor was established on the basis that, with 50 per cent void space, more than one-half should be noncapillary porosity. It is concluded that the production and maintenance of the optimum porosity factor should serve as the basis for the development of tillage operations and of machinery for performing them.

A method for determining the volume of capillary and noncapillary porosity of soils is outlined.

Soil erosion of soybean land, F. L. DULEY (*Jour. Amer. Soc. Agron., 17 (1925), No. 12, pp. 800–803*).—Studies conducted at the Missouri Experiment Station are briefly reported which showed that the amount of soil lost by erosion from soy bean land on a 3.68 per cent slope was greater than that from corn land where the corn followed clover and was itself followed by wheat. The loss of soil from soy bean land during the first year was only about half that from land in corn continually, but during the second year, which was one of greater rainfall, the erosion from the former was much higher.

The erosion from soy bean land was 86 times as great as that from sod land. The nitrogen lost in the eroded soil from the soy bean land averaged 32.18 lbs. per acre. It is concluded that soy beans can not take the place of sod legumes, such as the clovers, on rolling land, because they do not give sufficient protection to the soil.

Water as a growth factor [trans. title], O. ARRHENIUS (*Meddel. Centralanst. Försöksv. Jordbruksområdet [Sweden], No. 295 (1926), pp. 19, figs. 3*).—Experiments to show the relation between the water content of different soils, sand, clay, and peat, and the yield of different cultivated plants are reported.

Apparently the same plant behaved in the same way toward the soil moisture of different soil types when this was calculated on the basis of available water in relation to available water at full water capacity. On the other hand, different plant species behaved in different ways toward the water content. A satisfactory yield of sugar beets was obtained at a rather low water content, followed in order by wheat, barley, oats, and clover. The clover required considerable water in the soil to produce a good yield.

These results are taken to indicate that if the influence of the water content of one soil on a certain species of plant is known, it is possible to calculate the behavior of the plant in other soil types when the constants for unavailable water and full water capacity are known.

In this connection data on the water requirements of different plants at different soil moisture points and the water requirements at maximum growth are presented. On the assumption that 50 per cent of the rain during the summer season is lost by evaporation, the conclusion is drawn that in the agricultural regions of southern Sweden crops obtain from 600 to 2,500 cubic meters (21,180 to 88,250 cu. ft.) of water from March to August, and that in the case of the experimental crops more than 600 cubic meters of water are required. This is taken to indicate that in some parts of Sweden irrigation would give good results.

Experimental studies of agricultural hydraulics [trans. title] (*Rev. Facult. Agron. La Plata, 3. ser., 15 (1923), No. 1, pp. 5–39, figs. 12*).—Three series of studies are reported, the first of which dealt with the benefit of irrigation in general on alfalfa, Sudan grass, maize, and cane.

Flooding was found to be a more rational system of irrigation of alfalfa than the furrow system. This was especially true with alfalfa seeded in rows during dry seasons. Mulching between rows of Sudan grass after each cutting increased the yield. However, mulching apparently did not materially increase the effectiveness of irrigation. A single irrigation applied at the critical period was found to produce a greater crop of maize than either two or three irrigations.

The second series of studies dealt with subirrigation. This method produced a considerably larger crop of alfalfa than surface irrigation. The maximum distance apart for tile lines was found to be 1 meter (39.37 in.). Subirrigation increased the crop of sugar beets over that produced by surface irrigation and also increased the total yield of sugar. Bigger crops of onions and tomatoes were also produced by subirrigation, although the differences were not so great as with other crops.

The third series of studies dealt with the water requirements of certain crops, and data on the subject are presented. With alfalfa, for instance, increasing the total amount of irrigation increased the production of green material. However, the production of dry organic matter increased much more slowly as the amount of irrigation increased. The unit consumption of water increased markedly for each irrigation. This is taken to indicate that such utilization of water by the plant is not always an economical one.

It is concluded that the ideal solution of this problem consists in determining the economical limit beyond which additions of water produce no useful results. This will depend upon the year, soil, and climate, and under the conditions tested, the optimum was found to correspond to three irrigations.

The effects of various methods of applying fertilizers on crop yields, D. G. Coe (*Soil Sci., 21 (1926), No. 2, pp. 127–141*).—Studies conducted at Iowa State College are reported. While no definite conclusions are drawn, it is recommended that a combination fertilizer-grain drill be used in fertilizing cereals like oats and wheat. Moderate applications of noncaustic fertilizers were found to give the most economical returns by this direct-contact-in-the-seed-rows method. As much as 400 lbs. per acre of 16 per cent acid phosphate or 300 lbs. of commercial 2–12–2 fertilizer were drilled with the seed without appreciable injury to germination or reduction in yields.

The results indicated that larger applications than these or the distribution of fertilizers containing caustic ingredients like cyanamide should be made separately from the seeding. The best yields with cyanamide came from broadcasting it 10 days in advance of seeding. For large applications of noncaustic fertilizers, the best method appeared to be a splitting of the total application between the drilled direct-contact-in-the-seed-rows method and the broadcast method.

The results showed no advantage in spring applications either for the entire fertilizer application or for part of it. The drilling of the fertilizer as a separate operation to the seeding, no matter what the depth or the time period before the seeding, was not equal to the direct-contact method, provided moderate amounts of the noncaustic fertilizers were used. The use of a second set of delivery pipes for distributing the fertilizer above the seed row was found to safeguard the germination, but failed to give benefits warranting their adoption. Where broadcast applications of fertilizers were made with a lime sower or by other means upon the seed bed surface, the best results were secured when the fertilizer was worked into the soil by thorough disking.

In the fertilization of corn the hill methods appeared equal to or even superior to the broadcast method if the fertilizer was not delivered into the hills in direct contact with the seed. Earlier maturity was secured with the

hill method. Comparisons of the rear-of-hill and sides-of-hill methods indicated that the latter was preferable. It did not give the direct-contact-in-the-hill location as the rear-of-hill method often does, and hence the sides method is recommended over the rear method for preventing injury to seed germination. The results are taken to indicate that a satisfactory design of attachment is needed to guarantee the sides location of the fertilizer for all machines sowing seeds in wide rows or in hills, such as corn, cotton, beets, and potatoes. In fact, the sides-lower-plane location for the fertilizer gave the best yields of potatoes in these studies.

Fuel from pine stumps: A land clearing by-product, M. J. THOMPSON and A. J. SCHWANTES (*Minnesota Sta. Bul. 227 (1926), pp. 5–15, figs. 5*).—Data from 9 experimental plats for the study of the conversion of pine stumps into fuel which were under observation in 1924 and 1925 are presented and discussed. The stumps averaged 56.9 per acre in number and 18.5 in. in diameter. The cord wood production ranged from 3.13 to 16.88 cords per acre, with an average of 9.74 cords. It required 10 hours to blast an acre of stumps and 2.8 days of man labor and 3 of horse labor to assemble the stump fragments for sawing. It required 65 lbs. of explosive to stump an average acre. Much of the stump material needed splitting or blasting before sawing. This required not quite 1 hour per cord. About 1.75 hours of one man's time, nearly 0.75 hour of tractor time, and a trifle over 0.25 lb. of explosive were required to saw 1 cord of stump wood fuel. The total cost, including clearing, of a cord of stump wood fuel tightly piled was found to be about $4. This included labor 57 per cent, blasting material 31 per cent, and power 12 per cent. Clearing the land constituted 70 per cent of the fuel costs, and working the stumps into fuel made up the remaining 30 per cent.

Public Roads, [July–August, 1926] (*U. S. Dept. Agr., Public Roads, 7 (1926), Nos. 5, pp. 93–108+[2], figs. 20; 6, pp. 109–128+[2], figs. 15*).—These numbers of this periodical contain the status of Federal-aid highway construction as of June 30 and July 31, 1926, respectively, together with the articles following:

No. 5.—Static and Impact Strains in Concrete, by J. T. Thompson (see below); Effect of Size of Brick on Rattler Loss, by F. H. Jackson; A Device for Measuring Pressure Used in Molding Cement Mortar Briquettes, by F. H. Jackson and D. O. Woolf; The Strength of Mortar and Concrete as Influenced by the Grading of the Sand, by J. G. Rose; and More Accurate Tests of Reinforcing Bars, by D. O. Woolf.

No. 6.—The Connecticut Transportation Survey; Adaptation of Atterberg Plasticity Tests for Subgrade Soils, by A. M. Wintermeyer; Fifth International Road Congress Opens at Milan, Italy; Proceedings of Highway Research Board; and Virginia Building Demonstration Road, by C. A. Hogentogler.

Static and impact strains in concrete, J. T. THOMPSON (*U. S. Dept. Agr., Public Roads, 7 (1926), No. 5, pp. 93–100, figs. 13*).—Studies conducted by the Bureau of Public Roads in cooperation with Johns Hopkins University on the action of plain concrete beams under impact forces, and specifically to determine the static and impact moduli of rupture, are reported.

The results showed that plain concrete beams subjected to static load have a considerably lower modulus of rupture than exactly similar beams subjected to successive impacts of increasing magnitude caused by dropping a weight upon the beam from progressively increasing heights when the weight is dropped but once from each height. Under these conditions, in which the weight was dropped only five times from each height, the beams resisted without failure impact forces considerably in excess of the static loads which caused failure.

When, on the other hand, the beams were subjected to repeated applications of impact of the same magnitude, the greatest impact they would successfully withstand was that which produced a tensile stress equal to about 55 per cent of the static modulus of rupture. This is taken to indicate that the behavior of the concrete under impact is very similar to its behavior under static loads. Beams subjected to static loads for 10 seconds at a time showed the lowest modulus of rupture and impacts of an estimated duration of 0.015 second the highest, with an intermediate value corresponding to impacts of an estimated duration of 0.03 second.

The results also showed that the variation in stress from the top to the bottom of the plain concrete beam may not be represented by a straight line, but that the error involved in that assumption is small for ordinary safe working loads. It was also indicated that the impact force corresponding to a given height of fall is much greater when the fall is cushioned by worn solid rubber tires than when the cushioning medium is a new tire.

Researches in concrete, W. K. Hatt (*Purdue Univ., Engin. Expt. Sta. Bul. 24 (1925), pp. 102, figs. 31*).—Part 1 of this bulletin discloses the sequence and extent of research activities in concrete, part 2 reviews the status of some of the important fundamental researches in unsettled fields, and part 3 contains a bibliography of research in selected fields.

Small concrete construction on the farm, M. C. Betts and T. A. H. Miller (*U. S. Dept. Agr., Farmers' Bul. 1480 (1926), pp. II+38, figs. 37*).—Descriptions of sound methods of building a few simple concrete structures useful on the farm are given, supplementing Farmers' Bulletin 1279 (E. S. R., 48, p. 287).

Preservative treatment of farm timbers (*Iowa Sta. Rpt. 1925, p. 47*).—Data from an experiment started three years ago (E. S. R., 53, p. 789), in which water-gas tar was used in varying proportions with creosote, indicate practically no failures in cottonwood posts. It is considered probable that water-gas tar will be an effective preservative. This is said to be important, since the tar may be obtained at a very small cost as compared with the creosote.

The importance of electricity in agriculture, with special reference to South Africa, A. H. E. Rogers (*So. African Jour. Indus., 8 (1925), No. 12, pp. 781–789, figs. 3*).—A brief outline of some of the important factors involved in the application of electricity to South African agriculture is presented, special attention being drawn to the financial difficulties involved. A list of uses of electricity on South African farms is presented, and the conclusion is drawn that the biggest field for electricity in South African agriculture appears to be in the poultry, dairying, and fruit sections.

[**Rural electric experiments**], C. H. Churchill, Jr. (*C. R. E. A. Bul. [Chicago], 2 (1926), No. 3, pp. 8, pl. 1, figs. 5*).—Experiments on the development of an electric milk cooler outfit for the small and medium sized dairy are briefly reported, and notes on its construction are presented. Data are also presented on an electric wood sawing outfit and on threshing and feed grinding experiments.

Building the farm dairy house, L. W. Morley (*Penn. State Col. Ext. Circ. 107 (1925), pp. 9, figs. 4*).—Drawings, information, and a list of materials for building the farm dairy house for Pennsylvania conditions are presented.

Cheese factory and creamery plans with specifications (*Canada Dept. Agr. Bul. 47, n. ser. (1925), pp. 35, figs. 9*).—Drawings and specifications for creameries and cheese factories, with special reference to Canadian conditions, are presented.

RURAL ECONOMICS AND SOCIOLOGY

[Agricultural economics investigations in Iowa, 1925] (*Iowa Sta. Rpt. 1925, pp. 6, 7*).—Some of the results obtained are as follows:

Economic investigation of the manufacturing and marketing of Iowa dairy products.—The first essential to success in cooperative creameries was found to be a high production of milk per square mile on a fairly permanent basis. The advantageous price of butter during recent years as compared with other farm products has tended to encourage unwarranted building of creameries in the State.

Study of differentials in hog prices.—The study of the prices of various grades and classes of hogs at the different marketing outlets for Iowa hogs has established more or less definitely the facts that (1) there is a normal differential between the markets about which the actual differentials fluctuate, and (2) this normal differential varies between markets and between the various grades of hogs on the same and on different markets. The variations from the normal differentials are classed as (1) chance, due to conditions related to the market itself; (2) day to day, due principally to the receipts at the various markets; (3) seasonal, due to causes such as the effect of the price of corn upon the weight to which hogs are fed; and (4) long time, such as between light and heavy hogs, due to changing usages in consumption.

Washington agriculture.—Part 1, Dairying. Part 2, Hay and forage crops. Part 3, Recommendations and resolutions (*Wash. State Col. Ext. Bul. 134 (1926), pts. 1, pp. 39, figs. 16; 2, pp. 19, figs. 13; 3, pp. 16*).—Data are given as to dairy cattle, dairy products, and hay and forage crops, together with recommendations of the committees on dairy production, hay, pastures and succulence, and marketing of the Economic Conference on Dairying, Hay, and Forage Crops held at Seattle, Wash., on March 15 and 16, 1926. Part 1 of this bulletin is by E. V. Ellington and D. G. Magruder, and part 2 by L. Hegnauer.

An economic study of berry farming in western Washington, N. W. Johnson and G. Severance (*Washington Col. Sta. Bul. 204 (1926), pp. 79, figs. 13*).—The results are given of the study made on 116 berry farms in 1924 and 1925 to determine (1) the factors in their organization which make for success or failure, (2) what types of farming may be combined most profitably with berry farming, (3) the cost of production for different kinds of berries, and (4) the labor distribution and labor problems.

Berries combined with poultry raising were found to be more profitable, and when combined with dairying less profitable, than berry farming alone. Larger size, more complete utilization of land for crops, size of yields, growing of more than one kind of berry, and the investment of the larger proportion of capital in land rather than buildings and equipment were fonnd usually to be distinguishing features of the more successful farms.

The average cost per pound of producing berries during the period of full bearing, based on 1923 and 1924 yields, were found to be raspberries 8.52 cts., blackberries 4.23 cts., and strawberries 6.7 cts. The monthly man and horse labor requirements of different berry crops and the labor problems of each are discussed. Suggestions are made as to the methods of combining crops, reducing labor requirements, overhead costs, increasing yields, and making use of cooperative organizations for marketing and canning.

Production costs and market distribution of Arkansas peaches, C. O. Brannen (*Arkansas Sta. Bul. 207 (1926), pp. 3–29, figs. 7*).—The number of bearing peach trees in Arkansas and competing sections has increased very rapidly since 1920 and will continue to increase until 1928 at least. The cost

per acre with interest of developing a 4-year-old peach orchard in Arkansas, allowing $50 per acre for the land, was found to be $112 for the Ozark foothills section and $121 for the Highland district. The cost f. o. b. local station of producing peaches, including interest, based on the 1925 cost rates, was $93.24 (93 cts. per bu.) in the foothills section and $114.83 (92 cts. per bu.) in the Highland section, and the receipts above costs per acre $87 and $110, respectively, for the two districts. The costs per acre will probably increase, but the cost per bushel can be reduced by increasing yields, improving the quality of the fruit, and extending the life of the trees through better orchard practices. Better grading, marketing, and distributing methods and lower transportation charges to eastern markets are also thought to be needed.

Child labor in fruit and hop growing districts of the northern Pacific coast, A. CHANNING (*U. S. Dept. Labor, Children's Bur. Pub. 151 (1926), pp. V+52, pls. 2*).—This is a report of a survey of the work of children in the orchards and hop yards of the Yakima Valley, Wash., and the Willamette Valley, Oreg., and in the berry fields of the Puyallup Valley, Wash. The report covers the kinds of work done, ages, sex, hours employed, and earnings of the children, and the effects of their employment on school attendance and school work. The living conditions of the local and migratory workers are described, and an appendix includes statistics as to the hours of field work of mothers in the fruit and hop-growing districts.

Agricultural credit and the control of land-values, H. BELSHAW (*New Zeal. Jour. Sci. and Technol., 8 (1926), No. 2, pp. 76–83, fig. 1*).—Effective control of land values is held to be essential to the establishment of a safe system of agricultural banking. It is essential that a rise of land values not in accordance with the real productive value over a period of years should be prevented to insure safe long-time loans. The author outlines a plan of taxes on land value increments. On each transfer by sale or death, a special tax would be levied up to one-third or more of the increment in the price since the last sale, allowing a deduction for the productive value of improvements added since the last sale or adding an amount equal to the fall in value in the improvements in case of depreciation. In sales after the third year of possession, a further deduction from the taxable increment would be made for each year's possession until a certain percentage of the increment, 25 per cent suggested, would be tax free. It is also suggested that the tax might be graduated as the value of the property increased.

Such a tax would reduce the anticipation of increases in value and the rates of rise in values, would reduce speculative holdings, encourage longer tenure, encourage making permanent improvements, make more stable security for loans, and yet give the owners a share in the increment in price between purchase and sale.

Farm mortgage and commercial bank loans to farmers in Arkansas, C. O. BRANNEN (*Arkansas Sta. Bul. 208 (1926), pp. 3–37, figs. 6*).—Statistics and other information are given regarding the amounts and kinds of credit extended to Arkansas farmers, the sources of such credit to the farmers and the security upon which it may be obtained, and the costs involved in lending credit to farmers. Of the amount of real estate mortgage loans in 1925, 39 per cent was made by Federal land or joint stock land banks, 21.5 per cent by mortgage companies, 11.7 per cent by commercial banks, and 27.8 per cent from other sources. Commercial banks supplied 67.1 per cent of the funds for short time credit, agricultural credit corporations 1.3 per cent, and merchants and others 31.6 per cent.

The prevailing rate of interest for commercial bank loans for the State was found to be 10 per cent and the prevailing period 12 months for a loan secured

by mortgages and from 3 to 9 months for other loans. The percentages of loans made on different types of security varied greatly in different districts of the State but for the entire State were found to be 58.4 per cent on first mortgages, 7.6 per cent on second mortgages, and 34 per cent on personal endorsement, collateral, and similar security. Some of the factors responsible for the high interest rate and farm credit problems are the sharp fluctuations in the annual value of crops, one-crop farming, loans for operations on unprofitable lands, loans out of proportion to the assets of the farming business, overcompetition in loaning, the high costs of making and carrying loans due to the small size of loans, high overhead due to small size of banks, and the method of financing highways which has reduced the margin between appraised value of lands and the amount of loans.

Preliminary report on the marketing of agricultural produce (*Rome: Internatl. Inst. Agr., 1925, pp. 32*).—This is the preliminary report presented to the agricultural advisory committee on a proposed study on the marketing of agricultural products. The essential and auxiliary functions which bring about the different utilities that marketing confers on economic goods are classified and described briefly. An outline showing the agencies which perform the several functions and a statement of what the International Institute of Agriculture has done or is doing that will assist in the marketing study are given. A questionnaire covering the marketing functions and agencies is presented, with the suggestion that it be followed quite closely by the several countries in any marketing studies made in order that the results may be comparable and capable of being combined.

Management problems of cooperative associations marketing fruits and vegetables, A. W. McKay and W. J. Kuhrt (*U. S. Dept. Agr. Bul. 1414 (1926), pp. 52, figs. 5*).—Returns from 1,290 associations with a membership of over 200,000 show the most acute problems of such associations to be volume of business insufficient to stabilize the market, too many varieties produced, poor packing and lack of storage facilities and grade standards, inability to control deliveries to the associations, inefficient sales service, consumption restricted by retailing methods and margins, and transportation problems. These problems, the organization, financing and management, operating of cooperative marketing associations, the marketing agencies and their methods, and the functions of cooperative associations are discussed.

Preliminary report on the sale of agricultural produce by producers' cooperative societies to consumers' cooperative societies or directly to consumers (*Rome: Internatl. Inst. Agr., 1925, pp. 21*).—This report discusses the need, advantages, and problems of dealings directly between producers' cooperative organizations and consumers' cooperative organizations or consumers themselves. Brief descriptions are given of the methods being used in different countries in determining prices, apportioning profits, etc., between the two types of organizations.

Picking, packing, and shipping apples, T. J. Talbert and F. S. Merrill (*Missouri Sta. Circ. 147 (1926), pp. 43, figs. 35*).—Information is given regarding harvesting, packing, and shipping apples.

[Elevator management study at North Dakota Station], A. H. Benton (*North Dakota Sta. Bul. 194 (1926), p. 68*).—Studies covering the period 1919–1925 based on the records of 411 elevators show that, exclusive of interest paid or received, the operating cost per bushel decreased as the volume of grain handled increased from 10.19 cts. per bushel for elevators handling 50,000 bu. or less to 2.9 cts. for elevators handling 200,000 bu. or more. The net operating income increased from a loss of 0.4 ct. per bushel to a profit of 2.5 cts. per bushel as the volume handled increased.

The warehouseman and the United States Warehouse Act, P. M. WILLIAMS (*U. S. Dept. Agr., Misc. Circ. 67 (1926), pp. II+15, fig. 1*).—The purpose and scope of the act, the prerequisites for obtaining licenses, and the benefits to licensed warehousemen and producers storing in transit are set forth. The four types of commodity warehousing now practiced and the relative values of the warehouse receipt under each from a credit standpoint are discussed.

Crops and Markets, [July, 1926] (*U. S. Dept. Agr., Crops and Markets, 6 (1926), Nos. 1, pp. 16; 2, pp. 17–32; 3, pp. 33–48; 4, pp. 49–64; 5, pp. 65–80*).—The usual market information, tabulations, notes, and summaries are given for livestock, meats, and wool, fruits and vegetables, dairy and poultry products, hay, grain, feed, cotton, and foreign crops and markets.

Monthly Supplement to Crops and Markets, [July, 1926] (*U. S. Dept. Agr., Crops and Markets, 3 (1926), Sup. 7, pp. 193–232, figs. 3*).—The usual tables and notes are given for acreage, condition, and yield of important crops on July 1; commercial acreage of truck crops; estimated price of farm products received by producers June 15; stocks in cold storage July 1, 1926; corn and hog ratios; the livestock and meat situation, May, 1926; milk and dairy products; shipments of vegetables and fruits; cotton imports and consumption; monthly prices of wool, 1910–1926; the price situation; and world agriculture. Special tables and reports are included for the June 1 pig survey, the hog outlook July 17, acreage and condition of cotton on June 25, stocks of wheat in country mills and elevators and on farms July 1, acreages of different kinds of tame hay, sugar beet acreage and crop forecast, acreage of tobacco of different types, wages paid farm labor by States, July, 1924–1926, and farm wage rates and index numbers for 1910–1926. The gross value of farm products and income from agricultural production for 1925 are noted below:

[*Value of farm products, income from agricultural production, and farm returns, 1925*].—The gross value of crops in the United States decreased from $10,770,000,000 in 1924 to $10,269,000,000 in 1925, while that for animal products increased from $5,902,000,000 to $6,694,000,000. Tables are given showing the values and percentage of total production of different crops and animal products for 1924 and 1925, the estimated gross value of farm production for 1909–1925, and the distribution by States of the gross value of farm products, 1924 and 1925, and animal products from 1920 to 1925. Other tables are included showing for the crop years 1919–20 to 1925–26 the gross income by groups of commodities, the net income available for capital invested in agriculture, the rates of return earned on all capital and by various owners of capital, the reward per farm family for labor and management, the indexes of net income per farm family, farm and factory wage earnings, and of their relative purchasing power, and the distribution of operators' gross income. A table is given, based on the reports of 15,330 farmers, showing for the United States and the six geographical divisions the average size of farm, value of real estate, value of personalty, gross receipts from different sources, cash outlay for different purposes, increase in inventory, interest paid, amount spent for improvements, and certain noncash items, together with comparative figures for the United States for 1922–1924 and for the geographic divisions for 1924. The average gross receipts for the 15,330 farmers reporting were $2,551, consisting of $993 from sales of crops, $897 from sales of livestock, $585 from sales of livestock products, and $76 from other miscellaneous items. The average current expenses were $1,477, consisting of $386 for hired labor, $242 for livestock purchased, $244 for feed, $69 for fertilizer, $47 for seed, $191 for taxes, $119 for machinery and tools, and $179 for miscellaneous expenses.

Price economics of what farmers sell, W. C. JENSEN (*South Carolina Sta. Bul. 226 (1926), pp. 69, figs. 2*).—Tables are given for the United States and

South Carolina showing (1) the average yearly prices and index numbers (average 1910–14=100) of these prices and of the purchasing power of cotton, tobacco, corn, oats, wheat, sweet potatoes, Irish potatoes, hogs, and milk cows from 1866 to 1924, and (2) the monthly average prices and index numbers (average 1910–1914=100) of these prices and of the purchasing power of cotton, cotton seed, corn, oats, wheat, hay, peanuts, sweet potatoes, Irish potatoes, cabbages, horses, hogs, beef cattle, sheep, milk cows, milk, butter, chickens, and eggs for the period January, 1910, to April, 1925. The methods used in constructing the index numbers are described.

Missouri farm prices and purchasing power, D. R. G. COWAN (*Missouri Sta. Research Bul. 84 (1926), pp. 3–34, figs. 9*).—Tables and graphs are given showing the monthly prices, monthly relative prices, and the monthly purchasing power of hogs, cattle, sheep, calves, horses, chickens, eggs, butterfat, corn, wheat, oats, hay, and apples from January, 1910, to December, 1925; the monthly index numbers of farm prices; and the monthly hog-corn ratios for the same period. The methods of constructing the relative prices, the index numbers, and the hog-corn ratios are described.

Two sets of monthly index numbers were constructed, (1) using the average monthly prices of the several commodities for the 60 months January, 1910, to December, 1914, and the average yearly quantities of each commodity marketed during the five years 1920–1924, and (2) using the average monthly price for each commodity for the given month during the period January, 1910, to December, 1914, and the normal amount of each commodity marketed in the given month. The two methods are compared and the possible merits and defects of the first, which has been chosen as the Missouri index number, are discussed. The two index numbers correspond quite closely in their values and month-to-month movements. The Missouri index number has a standard month-to-month variation of 6 per cent as compared with 7.01 per cent for the other, and its seasonal variation is not perceptible.

Rural social organization in Whitman County, E. A. TAYLOR and F. R. YODER (*Washington Col. Sta. Bul. 203 (1926), pp. 5–47, figs. 8*).—This is a study of the open country neighborhoods and rural service centers of the southeastern section of Whitman County, Wash., and shows "the rural life, its trends and movements, present day trends of social life, and rural and urban institutions of interest to the farmers." The section studied is one in which the average size of the farms in 1920 was 423 acres and the average value $41,624. From 1900 to 1920 the number of farms in the county decreased from 3,081 to 2,957, the average acreage increased from 379 to 423 acres, and the percentage of farms operated by tenants increased from 24 to 42 per cent. The type of farming generally practiced is winter wheat, alternated with summer fallow, or followed by oats, barley, or spring wheat, and then summer fallow.

FOODS—HUMAN NUTRITION

Foods and nutrition, M. E. SPENCER (*Natl. Catholic Welfare Conf. Bur. Ed., Ed. Bul. 1 (1926), pp. 65*).—This pamphlet is "a guide to the study of the food and nutrition problem written in nontechnical language adapted to the needs of school officials, mothers, and club women."

The body and its food, S. O. MORRIS (*Utah Agr. Col. Ext. Circ. 5, n. ser. (1926), pp. 16, figs. 7*).—A brief discussion in nontechnical terms of the nutritional needs of the body and the essentials of an adequate diet.

Health and environment, L. HILL and A. CAMPBELL (*New York: Longmans, Green & Co.; London: Edward Arnold & Co., 1925, pp. XI+208, pls. 8, figs. 20*).—This volume embodies most of the subject matter of three reports issued by the Medical Research Council, Great Britain. Part 1 covers the substance of

Special Report, Series Nos. 32 and 52, on the science of ventilation and open air treatment, parts 1 and 2; and part 2 that of Series No. 73, the katathermometer in studies of body heat and efficiency (E. S. R., 53, p. 764).

Practical dietetics with reference to diet in health and disease, A. F. Pattee (*Mount Vernon, N. Y.: Author, 1925, 15. ed., pp. XIII+646, figs. 9*).—A revision of the volume previously noted (E. S. R., 40, p. 561).

Standards for physcians conducting conferences in child-health centers (*U. S. Dept. Labor, Children's Bur. Pub. 154 (1926), pp. III+11, figs. 2*).—These standards have been drafted by the pediatric advisory committee of the Children's Bureau, U. S. Department of Labor, consisting of representatives from the American Pediatric Society, the pediatric section of the American Medical Association, the American Child Health Association, and the child hygiene division of the Children's Bureau.

Report of the Medical Research Council for the year 1924–1925, Earl of Balfour et al. (*[Gt. Brit.] Med. Research Council Rpt. 1924–25, pp. 164*).—This is the annual progress report on the research work in various branches of medical science conducted under the auspices of the Medical Research Council of Great Britain. The various nutrition studies included have for the most part been noted from other sources.

Original diets—classified and calculated (*New York: Dry Milk Co., 1926, pp. 72*).—This is a collection of tested recipes for foods and beverages said to be particularly adapted to patients requiring a liquid or soft diet, or suffering from tuberculosis, malnutrition, or nephritis. In the recipes requiring milk and dried milk Dryco is used in place of liquid milk.

Milk and its relation to public health (*[Minneapolis]: Minn. State Bd. Health, Div. Sanit., 1924, pp. 8, figs. 2*).—A general circular of information on the subject.

***Acidified milks, with special consideration of the indications and limitations to their use*, H. K. Faber** (*Amer. Jour. Diseases Children, 31 (1926), No. 3, pp. 395–409*).—This is a review and discussion of recent literature on the subject, with the following conclusion:

"On the basis of the available studies, acidified milk may be considered to be a useful therapeutic agent for certain specific disorders. As such, it should be given only when there are specific indications, and for periods of time limited by the regression of symptoms. Organic as well as inorganic acids deflect metabolism from the normal to a recognizable, though not as yet fully determined, extent. *For this reason the routine use of sour milk in the feeding* of normal infants is not to be encouraged. For them modification of cow's milk by dilution and carbohydrate addition remains the method of choice."

Proximate composition of beef, C. Chatfield (*U. S. Dept. Agr., Dept. Circ. 389 (1926), pp. 19, figs. 15*).—This study is reported as a step in the revision of Bulletin 28 of the Office of Experiment Stations (E. S. R., 11, p. 879). From a compilation of available data on the physical and chemical composition of beef, including some selected figures from Bulletin 28, data reported in bulletins from the Missouri, Illinois, and Maine Experiment Stations, and unpublished data contributed by the Office of the Surgeon General, U. S. Army, figures have been derived by statistical methods to represent the composition of typical wholesale cuts according to the classes which correspond with commercial grades. A method for estimating the protein and ash content of any wholesale cut from its fat content is presented. Graphic correlations between the protein and the fat content of sides and of certain cuts show that the composition of "fat free" beef is variable. It is demonstrated that the chemical composition of particular wholesale or retail cuts can be estimated within reasonable accuracy from a dissection of the cut into lean, fat, and bone.

Reduction of error in dietary calculations is possible, it is claimed, through the use of figures derived in this way.

The iron content of meats, E. B. FORBES and R. W. SWIFT (*Jour. Biol. Chem., 67 (1926), No. 2, pp. 517–521*).—Proximate analyses and iron determinations are reported for cured bacon and ham; pork and lamb shoulders and hind quarters; beef muscle (rib, round, loin, and chuck); veal fore quarter, hind quarter, and kidney; and beef heart, brain, liver, spleen, kidney, and blood.

In the iron analyses unusual care was taken to prevent contamination with iron. A special bronze knife and grinding machine were used in the preparation of the samples. The samples were first dried in an electric oven and then ashed in an electric muffle furnace, silica dishes being used for these operations. The iron was determined by titration with standard potassium permanganate solution. Triplicate analyses agreed within 0.0001 per cent.

The analyses showed that muscle meats from various parts of the carcass are similar in their iron content, but that organ meats are much richer in iron. In comparison with analyses of foods other than meats as compiled by Sherman (E. S. R., 38, p. 661), beef spleen, liver, kidney, and blood appear to contain more iron than any foods of vegetable origin, beef muscle 10 times as much iron as milk, twice as much as potatoes, 2½ times as much as white flour and corn meal, and 8 times as much as apples. Vegetable foods noted as containing more iron than does beef are peas, beans, lentils, graham flour, oatmeal, shredded wheat, and spinach.

The use of sodium nitrite in curing meat, W. L. LEWIS and R. S. VOSE (*Chicago: Inst. Amer. Meat Packers, Dept. Sci. Research [1925], pp. 33, pls. 4*).—Essentially noted from another source (E. S. R., 55, p. 86).

Some variable factors of bread production, C. G. HARREL (*Cereal Chem., 3 (1926), No. 1, pp. 1–18, figs. 16*).—The author discusses, with illustrative data, the variables affecting the quality of bread. Among the more common variables which are apt to be overlooked are absorption of water by the dough, correct panning of the dough, pan greasing (which should not be too heavy), and the time and temperature of mixing. Fermentation is considered to be the most important single factor in bread production. This is discussed from the standpoint of straight doughs and sponge doughs. In discussing the action of acids on the two types of doughs, the dough ingredients are classified as (1) factors resisting an increase in acid formation, or the buffer value of the dough, and (2) forces tending to overcome the buffer value, chiefly the yeast and acid-accelerating salts. Measurements are given of these factors.

Method for a graphic record of texture, volume, and contour of cakes, A. M. CHILD and D. I. PURDY (*Cereal Chem., 3 (1926), No. 1, pp. 57–60, fig. 1*).—The method described, the idea of which was suggested by the paper of Mohs on the size of pores in bread (E. S. R., 53, p. 261), consists first in making a simple ink pad by saturating a blotter with a mixture of equal parts of mimeograph ink, glycerin, and water, and covering the blotter with a thin, smooth cloth. A ½- to ¾-in. thick sample of the cake is then used as a stamp, the print being made on ordinary mimeograph paper or Bristol board. Care should be taken both in pressing the cake on the pad and in making the print that every portion of the cell surface touches the surface of pad or paper and that the cake is placed and removed without rubbing. Specimens of prints produced from plain cake made with no egg and with 1, 2, and 3 eggs are reproduced, showing clearly the relative grain, volume, and contour. It is stated that the prints are especially valuable when used in connection with the specific volume of the cake, and afford a much more definite and accurate method of judging cakes, muffins, and like products than was previously available.

The family fruit and vegetable budget, M. D. SWEETMAN (*Iowa Agr. Col. Ext. Serv. Home Econ. Bul. 81 (1925), pp. 8*).—The budget idea has been applied to an estimation of the amount of fruits and vegetables which should be grown, canned, and stored to supply a family of 5 or 6 with two servings of vegetables in addition to potatoes and two of fruit daily. A planting table, prepared in cooperation with C. V. Holsinger, offers suggestions as to the type and variety of vegetables, the method and time of planting, and the amount of seed to supply an average family with fresh vegetables in season. A simple canning budget, allowing one canned vegetable a day, and a storage budget to supplement the canning budget are also given. The latter, prepared by C. V. Holsinger and M. Baker, includes the methods of storing and amounts required for specified numbers of servings for a family of 6 of dry beans, beets, carrots, turnips, rutubagas, cabbage, parsnips, salsify, sweet potatoes, squash, celery, onions, white potatoes, and apples.

Considerations that must be taken into account before buying fruits and vegetables to can are emphasized, and suggestions are given as to methods of canning and the examination of canned food for use.

A bibliography of the nutritive value of chocolate and cocoa, compiled by E. C. WILLIAMS (*Hershey, Pa.: Hershey Chocolate Co., pp. IV+5–64*).—An annotated bibliography of 166 references, with a brief discussion of the place of cocoa and chocolate in a balanced diet.

The composition of some Chinese foods (*Hawaii Univ., Occas. Papers No. 3 (1925), pp. [3]*).—This compilation includes proximate analyses, weights and approximate measures of 100 calorie portions, and the scientific and Chinese names of a number of Chinese foods, including algae, arrowhead, bean curd, soy bean milk, dried green mung, green mung sprouts, dried black and yellow soy beans, yellow soy bean sprouts, yam bean roots, birds' nests, cabbage, dried dragon's eye, preserved eggs (pidan), horn chestnuts, dried jujubes, dried litchi nuts, fresh lily bulbs, dried lily flowers, lotus roots, bitter melons, winter melons, dried mushrooms, okra, white nuts, persimmons, Chinese spinach, taro, turnips, and water chestnuts.

Proteins, S. P. L. SØRENSEN (*New York: Fleischmann Labs., 1925, pp. XX+142, pl. 1, figs. 23*).—Six lectures, chiefly on proteins, and an informal address delivered by the author during the course of his visit to the United States in 1924 have been assembled in this volume. One of the lectures has been noted from another source (E. S. R., 53, p. 261).

The effect of high protein diets on the kidneys of rats, H. JACKSON, JR., and M. D. RIGGS (*Jour. Biol. Chem., 67 (1926), No. 1, pp. 101–107*).—Essentially noted from another source (E. S. R., 54, p. 391).

Notes on the metabolism of amino and fatty acids, H. D. DAKIN (*Jour. Biol. Chem., 67 (1926), No. 1, pp. 341–350*).—This paper consists of short notes on experiments dealing with the fate of γ-triphenylpropionic and α-amino-β-trimethylpropionic acids in the animal body, the action of muscle and liver tissue on acrylic and hydracrylic acids, and the fate of some uramino acids and hydantoins in the animal body.

Notes on basal metabolism.—VIII, Tables of values of the Du Bois surface area formula, W. H. STONER (*Jour. Lab. and Clin. Med., 11 (1926), No. 4, pp. 355–368*).—"Values of the Du Bois formula for human surface area [E. S. R., 35, p. 370] are tabulated by unit centimeter and kilogram intervals for individuals of 110 to 200 cm. in height and of 20 to 110 kg. in weight."

Estimation of the surface area of the white rat, G. G. CARMAN and H. H. MITCHELL (*Amer. Jour. Physiol., 76 (1926), No. 2, pp. 380–384*).—For use in studies of the effect of various factors other than size upon the basal heat production of the white rat, the authors have determined the surface area of 62

rats varying from 25 to 461 gm. in weight, and from the data on weight and surface area have calculated in each case the Meeh constant *k* from the equation

$$S=k\,W^{\frac{2}{3}}$$

in which *S* equals the skin area in square centimeters and *W* the weight in grams.

The average Meeh constant for the entire series was 11.36±0.05. The average deviation of the individual values of *k* from the average value was 3.61. Approximately 75 per cent of the individual animals were within 5 per cent of the average, and only 8 per cent were more than 10 per cent above the average. There was no appreciable difference between the males and females.

Some properties of the vitamins (*Nature [London], 117 (1926), No. 2945, pp. 522–524*).—A review of recent literature on the subject.

On the physical and chemical properties of biosterin (a name given to fat-soluble A) and on its physiological significance, K. Takahashi, Z. Nakamiya, K. Kawakami, and T. Kitasato (*Inst. Phys. and Chem. Research [Tokyo] Sci. Papers, 3 (1925), No. 32, pp. 81–145, figs. 24*).—This is a translation of the complete report in Japanese of an investigation which has been noted from preliminary reports (E. S. R., 53, p. 660).

Vitamin A in poultry flesh and fat, R. Hoagland and A. R. Lee (*Jour. Agr. Research [U. S.], 33 (1926), No. 1, pp. 29–40, figs. 11*).—The technique followed in this study was the same as outlined in the report of the previous study of vitamin A in beef, pork, and lamb (E. S. R., 54, p. 390). The material tested consisted of the dried flesh from two lots each of chickens, ducks, geese, turkeys, and guinea fowls and of the fat from two lots of chickens and one lot each of turkeys and geese. The dried flesh was fed in amounts varying from 10 to 30 per cent of the ration and the fat in amounts of 5 and 10 per cent. Each material was tested on four rats.

As judged by the growth curves, the flesh from one lot each of ducks and of guinea fowls contained considerable amounts and from one lot of chicken flesh a fair amount of vitamin A. All of the other samples were deficient. One sample of chicken fat and the single sample of goose fat contained appreciable amounts of A, but turkey fat was deficient in this vitamin.

The authors admit that the data presented are too limited to permit any conclusion to be drawn considering the value of the substances tested as a source of vitamin A.

A note on the technique for studying vitamin B, A. H. Smith, G. R. Cowgill, and H. M. Croll (*Jour. Biol. Chem., 66 (1925), No. 1, pp. 15–21, figs. 3*).—Evidence along several lines is given supporting the opinion, first expressed by Steenbock, Sell, and Nelson (E. S. R., 49, p. 665) and later reinforced by various investigators but denied by McCollum, Simmonds, and Becker (E. S. R., 53, p. 766), that access of rats to their excreta vitiates quantitative experimental work on vitamin B. If only comparative results not highly quantitative in character are desired it is considered not so essential to guard against coprophagy. Separate caging of the animals and frequent thorough cleaning of the cages are recommended as essential in work of a quantitative nature.

The vitamin B of lemon rind, S. G. Willimott (*Biochem. Jour., 20 (1926), No. 1, pp. 31–36, fig. 1*).—In the experiments reported, a 90 per cent alcohol extract of the outer rind of the lemon (the flavedo) was fed to a group of 3 male and 5 female rats averaging 69.2 gm. in weight at the beginning of the experiment. The oil was incorporated in amounts of 0.5 cc. daily, equivalent to 0.25 gm. of rind, in a basal vitamin B-free ration consisting of potato starch

40, sugar 17, refined palm kernel oil 15, pure extracted casein 23, and salt mixture 5 per cent. Care was taken to prevent the rats from having access to their excreta. The experiment was continued for 10 weeks, during which the average growth of the males was 79 per cent and of the females 91 per cent of the controls on a normal diet. All of the animals were in good health at the end of the experiment.

It is concluded that the flavedo of lemon rind contains appreciable amounts of vitamin B, although the amounts furnished were not quite sufficient for normal growth.

The diet was tested further for its adequacy for reproduction by mating 2 of the experimental males with females from the same group. Two litters of 6 and 8 animals each were produced but were not reared.

Ultra-violet light and the antiscorbutic vitamin, P. Eggleton and L. J. Harris (*Brit. Med. Jour., No. 3387 (1925), pp. 989–991, figs. 6*).—A summary is given of various experiments conducted to determine whether there is any relationship between vitamin C and ultra-violet light similar to that existing between vitamin D and ultra-violet light. These included attempts to determine whether light is necessary for the synthesis of vitamin C in oats during germination, whether irradiation of guinea pigs on a scorbutic diet is capable of preventing or curing scurvy, and whether food materials can be rendered antiscorbutic by irradiation. In all cases negative results were obtained, thus indicating that vitamin C can not be synthesized by ultra-violet light.

Egg yolk as a source of the anti-scorbutic vitamin, J. E. Dougherty (*Amer. Jour. Physiol., 76 (1926), No. 2, pp. 265–267*).—In this study fresh egg white and egg yolk fed in amounts of from 2 to 8 cc. per guinea pig daily were found to be of no value in preventing scurvy. Larger amounts were not tolerated by the animals.

The effect of chemical preservation of eggs upon the stability of their vitamin contents, E. Tso (*Biochem. Jour., 20 (1926), No. 1, pp. 17–22, figs. 5*).—Essentially noted from a preliminary report (E. S. R., 53 p. 459).

Hydrogenated vegetable oil as a source of vitamin E, C. Kennedy and L. S. Palmer (*Amer. Jour. Physiol., 76 (1926), No. 2, pp. 316–319, fig. 1*).—Data are reported showing that reproduction has been secured in three successive generations of rats on the Evans and Bishop sterility diet by the substitution of hydrogenated cottonseed oil (Crisco) for the lard of the original diet. These results confirm the conclusion arrived at independently by Evans and Burr (E. S. R., 54, p. 561) that Crisco is a good source of vitamin E, and that this vitamin is not destroyed by the hydrogenation of oils containing it.

Irradiation of foodstuffs with ultra-violet light.—A clinical investigation of the curative value of irradiated food in rickets, H. M. M. Mackay and H. F. Shaw (*Lancet [London], 1926, I, No. 1, pp. 8–11, figs. 2*).—This is the complete report, with clinical and X-ray findings, of an investigation noted from a preliminary report (E. S. R., 55, p. 387). A concise summary of the literature on ultra-violet irradiation, with 22 references, is included.

The antirachitic value of irradiated cholesterol and phytosterol.—IV, V, A. F. Hess, M. Weinstock, and E. Sherman (*Jour. Biol. Chem., 66 (1925), No. 1, pp. 145–160; 67 (1926), No. 2, pp. 413–423*).—These papers continue the series previously noted (E. S. R., 53, p. 767).

IV. *Factors influencing its biological activity.*—The authors report that further tests of the effect of aging or storing on the antirachitic properties of irradiated materials (E. S. R., 53, p. 568) have shown irradiated linseed oil to be still active after a year and dried milk after 3 months. Activated cholesterol was found to deteriorate much more rapidly, particularly when kept

in the dry state. It is also reported that prolonged intense irradiation permanently destroys the antirachitic properties of activated cholesterol, that cholesterol can be activated in an atmosphere of nitrogen and does not lose its potency when subjected to a partial vacuum, that recrystallization of irradiated cholesterol brings about a successive loss in its activity, that activated cholesterol loses none of its activity on prolonged contact with acetone, chloroform, or benzene, and that cholesterol extracted from egg yolk or from bone marrow has no antirachitic value.

V. *Chemical and biological changes.*—It has been demonstrated that highly purified cholesterol, anhydrous cholesterol, and cholesterol acetate (an unsaturated ester of cholesterol) can be rendered antirachitic by ultra-violet irradiation. This is thought to afford proof that it is the sterol itself which is activated and that the activation takes place at the double bond.

Irradiation of cholesterol for a moderate length of time appeared to increase its power of inhibiting the hemolytic action of digitonin and for a prolonged period to destroy the inhibiting effect. On precipitating irradiated cholesterol with an alcoholic solution of digitonin, no trace of antirachitic activity was shown by the filtrate. A comparison of the digitonin precipitate of irradiated and nonirradiated cholesterol showed that all of the sterol could not be precipitated after irradiation.

The value of irradiated cholesterol in the treatment of rickets, L. G. PARSONS (*Brit. Med. Jour., No. 3403 (1926), pp. 519–521*).—The author describes a case of severe rickets which showed no marked improvement during prolonged treatment (from April to September) with cod-liver oil, but was cured in 3 months by treatment with irradiated cholesterol. The cholesterol was given in solution in linseed oil in doses of 1 dr., increasing to 2 dr. three times daily.

The outbreak of botulinus poisoning in Solon, Ohio, E. R. HAYHURST (*Amer. Jour. Pub. Health, 16 (1926), No. 3, pp. 228–230*).—The outbreak described, involving two fatalities, was traced to a can of sardines in tomato sauce, the contents of which were said to have had a disagreeable odor and taste. In spite of the incriminating evidence two of the three members of the family ate freely of the sardines. The one member of the family who barely tasted them did not develop symptoms, while the other two developed typical symptoms of botulism in 36 and 42 hours and died in 4 and 17 days, respectively. In scrapings from the can botulinus toxin was identified by three different laboratories and further identified as type A by two of the laboratories.

Clinical calorimetry.—XXXIX, Exercise and the respiratory quotient in diabetes, H. B. RICHARDSON and S. Z. LEVINE (*Jour. Biol. Chem., 66 (1925), No. 1, pp. 161–183, fig. 1*).—This continuation of the extensive series of studies on clinical calorimetry, some of which have been noted (E. S. R., 51, p. 556), is an extension of the thirty-fourth study of the series (E. S. R., 51, p. 465) dealing with the respiratory exchange in diabetes.

The original purpose of the present study was to determine the effect of exercise on the ketogenic balance in diabetics, but it was found impossible to push the exercise to the point of increasing the ketone bodies of blood or urine beyond the limits of error of the analytical methods employed. Consequently the study was confined to the effect of exercise on the respiratory quotient. Two normal subjects and 6 diabetics (none taking insulin) were studied.

The data obtained show that in diabetes exercise results in a fall of the respiratory quotient below the basal level. The significance of this is discussed at considerable length, with references to the literature, and the conclusion is

drawn that the diabetic is unable to increase the oxidation of carbohydrate to the same extent as fat. The data are also thought to furnish evidence that fat can be oxidized in the mammalian organism without preliminary conversion into carbohydrate.

Salmon in a diet for the prophylaxis of goiter, N. D. JARVIS, R. W. CLOUGH, and E. D. CLARK (*Jour. Amer. Med. Assoc., 86 (1926), No. 18, pp. 1339, 1340, fig. 1*).—Attention is called to the value of canned salmon as a convenient and inexpensive source of iodine for use in goitrous regions. Determinations are given of the iodine content on the moist and dry basis of six species of salmon, each including samples from various districts. The average results for all species from all districts were 0.296 mg. per kilogram and 296 parts per billion on the moist basis and 0.933 mg. and 933 parts, respectively, on the dry basis.

Indigestion: What it is and how to prevent it, A. L. HOLLAND (*New York and London: D. Appleton & Co., 1926, pp. X+130, figs. 13*).—This small volume might well be called the psychology of indigestion, for special attention is paid throughout to the effect of the emotions upon the behavior of the stomach. The first chapter explains in simple nontechnical terms the normal behavior of the digestive canal. With this as a background, an explanation is given of the cause and significance of various symptoms associated with indigestion as the term is ordinarily understood. Chapters on food phobias and food idiosyncrasies, irregularities of the bowel function, acute digestive disturbances, general hygiene, and exercise complete the volume.

TEXTILES AND CLOTHING

The study of the cotton fibre, A. J. TURNER (*Agr. Jour. India, 21 (1926), No. 4, pp. 274–294*).—The results of recent investigations on the cotton fiber are reviewed, with particular reference to problems of the cotton industry dealing with structure and composition, physical and chemical properties, and practical aspects. The bibliography includes 65 titles.

The chemical analysis of cotton.—X, The ash content and ash alkalinity of typical cottons, R. G. FARGHER and M. E. PROBERT (*Brit. Cotton Indus. Research Assoc., Shirley Inst. Mem., 4 (1925), No. 10, pp. 175–182; also in Jour. Textile Inst., 17 (1926), No. 1, pp. T46–T52*).—In this continuation of the series of studies previously noted (E. S. R., 55, p. 208), determinations are reported of the ash content and the ash alkalinity as defined by Birtwell, Clibbens, and Ridge (E. S. R., 50, p. 413) of a number of representative samples of cottons of different origin. The average values are as follows:

North American cottons, ash 1.17 per cent, ash alkalinity 16.46, and ash alkalinity per gram of ash 14.1; South American cottons, 1.16, 16.67, and 14.3; Indian American cottons, 1.25, 18.6, and 14.9; other outside growths of American cotton, 1.47, 22.5, and 15.3; Egyptian cottons, 1.26, 20.04, and 15.86; Native Indian cottons, 1.28, 19.2, and 15.1; and Sea Island cottons, 0.98, 14.9, and 15.2, respectively.

The conclusion is drawn that the alkalinity per gram of ash is a fairly constant factor for different classes of cotton.

The effect of sizes on the elastic behaviour of flax yarns, J. A. MATTHEW (*Jour. Textile Inst., 17 (1926), No. 3, pp. T192–T205, figs. 6*).—A study of the effect of a large variety of the usual sizing ingredients on flax warp yarns showed that the elasticity of a sized yarn is approximately only half of that of an unsized yarn, and that the behaviors on stretching are quite different. While the nature of the various ingredients will considerably affect the appear-

ance of the yarn both before and after weaving, owing to their differing in resistance to rubbing, it will not essentially affect the strength and elastic behavior of the sized yarn when applied in the usual way. The major cause of this reduced elasticity of sized flax yarns was shown to be the tension applied to the yarn on the dressing machine after being wetted by water in the size mixture, since the effect was not produced by tension in the absence of water or by water in the absence of tension. A small decrease in elasticity, due to real adhesive action of starch, was also shown.

The advance of rayon, O. Wilson (*Indus. and Engin. Chem., 18 (1926), No. 8, pp. 829–831, figs. 2*).—A brief discussion is given of the growth of the rayon industry in this and other countries, with estimates for its production in 1924 and 1925 in 16 producing countries. The United States leads the list with an estimated production of 39,000,000 lbs. in 1924 and nearly 52,000,000 lbs. in 1925. The estimates for 1926 are from 74,000,000 to 80,000,000 lbs. According to one computation, 20 per cent of the rayon produced in this country in 1925 was used in hosiery, 10 per cent in knit outer wear, 18 per cent in silk mixtures, 21 per cent in cotton mixtures, 15 per cent in underwear, 8 per cent in braids, 2 per cent in upholstery goods, 1 per cent in woolen goods, 2 per cent in plush, and 3 per cent in miscellaneous uses. The chemical methods at present in use for the manufacture of rayon are outlined.

Viscose thread: Physical properties, A. L. Wykes (*Silk Jour., 2 (1925), Nos. 17, pp. 40, 41; 18, pp. 45, 46; 19, pp. 43, 44; 2 (1926), No. 20, pp. 47, 48; abs. in Jour. Textile Inst., 17 (1926), No. 4, p. A98*).—Using a hank of 250 denier undyed viscose thread, extension and elasticity measurements were made in a single thread tester on 12-in. lengths. The effect of winding under tension was investigated by determining the "wear left in the thread" as shown by the area of the load-extension curve.

By preventing tension at any time during manufacture from exceeding one-half of the breaking load of the thread, very little wear is taken out, whereas if this tension is exceeded the wear in the thread is very considerably reduced. The breaking load of the thread is very slightly increased during winding and is also greater the shorter the time taken in breaking the thread. Artificial silk threads apparently should never be handled in a damp state. The general principles for good winding are discussed in relation to the results obtained, and the causes of some common defects such as bright picks, tight picks, and tight warp ends are indicated. Friction causes a proportional loss in strength of artificial silk threads. The effect of tension on the elastic limit and the effect of wetting thread strained by excessive tension are shown.

The rôle of chemistry in the manufacture of silk, W. M. Scott (*Indus. and Engin. Chem., 18 (1926), No. 9, pp. 924–926, fig. 1*).—A brief outline, with accompanying chart, is given of the successive processes in the conversion of raw silk into yarn or fabric. Emphasis is given to the processes of throwing, degumming, and dyeing in which chemistry plays an important part.

A simple and reliable test for mercerisation, R. W. Kinkead (*Jour. Textile Inst., 17 (1926), No. 4, pp. T213–T219, pl. 1; abridged in Textile World, 70 (1926), No. 9, pp. 25–27*).—In the new test for mercerization described, a small sample of the material is stained with methylene blue and heated with a dilute solution of sodium carbonate under standard conditions. Under this treatment the mercerized material turns reddish-purple, the unmercerized remaining blue. By comparison with a range of known samples, the approximate concentration of the caustic soda employed in the mercerization may be estimated. Materials mercerized with strong mineral acids behave differently

under this test from those mercerized with caustic soda, a result which in conjunction with the positive reaction obtained with the iodine test makes it possible to distinguish these materials. Results with flax, hemp, and ramie are cited.

Textile dyeing, W. K. Robbins (*Indus. and Engin. Chem., 18 (1926), No. 9, pp. 927–929*).—A brief discussion of the contributions of chemistry during the past 50 years to the development of textile dyestuffs and the improvement of methods of dyeing yarns and fabrics.

A bio-chemical investigation of the action of certain low forms of vegetable life on textile fabrics, D. L. Sen (*Abs. in Indian Sci. Cong. Proc. [Calcutta], 11 (1924), pp. 94, 95*).—An investigation at the School of Technology, Manchester, England, showed that a minute quantity of food material suitable to the needs of microfungi is naturally present in all raw cottons, and that if these are exposed to a moist, warm condition for a prolonged period microfungi appear. The microfungi first appear on the surface of individual fibers and send their mycelium through the canal of the cotton fiber. In tests with two uniform samples of fabric and three average specimens for tropical markets, representing light, medium, and heavy grades of sizing, mildew appeared in all except one uniformly scoured sample after exposure to a moist, warm condition for over 30 days at 22.2° C. (72° F.). The growth of mildew was found to be nearly proportional to the quantity of foodstuffs present in the fabrics in the form of size materials. Scouring seemed to remove all direct food materials from the fabrics. Sizes of tuber starches were more susceptible to the action of microorganisms than cereal starches.

Laundry chemistry, A. Harvey (*London: Crosby Lockwood & Son, 1926, pp. VII+116*).—This elementary manual on the subject, although written for the practical laundryman, is suitable for use by laundry classes and as a general reference book. Of particular value is the chapter on stain removal, which includes a concise table by W. A. Lawrence outlining the treatment to be followed in the removal of grease, ink, India ink, paint, tar, varnish, iron rust, fruit, grass, coffee and tea, mildew, dye, and iodine stains from wool, silk, cotton, linen, mixed fibers, and delicate materials.

HOME MANAGEMENT AND EQUIPMENT

Planning your family expenditures, C. G. Woodhouse (*U. S. Dept. Agr., Misc. Circ. 68 (1926), pp. 6*).—Instructions are given for making family budgets and keeping records of expenditures.

MISCELLANEOUS

Report of the Hawaii Agricultural Experiment Station, 1925, J. M. Westgate et al. (*Hawaii Sta. Rpt. 1925, pp. [2]+24, figs. 10*).—This contains the organization list, a summary by the director as to the work of the year, and reports of the divisions of horticulture, agronomy, and chemistry, the extension and demonstration work on the Island of Hawaii, boys' and girls' club work, and of the Haleakala Substation. The experimental work recorded is for the most part abstracted elsewhere in this issue.

Annual Report [of Iowa Station, 1925], C. F. Curtiss and W. H. Stevenson (*Iowa Sta. Rpt. 1925, pp. 64*).—This contains a report on the work of the station, including a financial statement for the fiscal year ended June 30, 1925. The experimental work recorded not previously noted is for the most part abstracted elsewhere in this issue.

Thirty-seventh Annual Report [of Mississippi Station], 1924, J. R. RICKS ET AL. (*Mississippi Sta. Rpt. 1924, pp. 47, figs. 2*).—This contains the organization list, a report of the director on the work of the station, a financial statement for the fiscal year ended June 30, 1924, and departmental reports, the experimental work in which is for the most part abstracted elsewhere in this issue.

Biennial Report of the Missouri State Fruit Experiment Station, Mountain Grove, Mo., 1923–1924, F. W. FAUROT (*Missouri Fruit Sta. Bien. Rpt. 1923–24, pp. 8*).—This contains a financial statement for the fiscal biennium ended December 31, 1924, and a report of the director discussing the needs of the station during the ensuing biennium.

Experiment station progress: Report for the biennium July 1, 1923, to June 30, 1925, P. F. TROWBRIDGE ET AL. (*North Dakota Sta. Bul. 194 (1926), pp. 96, pls. 2, figs. 36*).—This contains the organization list, a report of the director and heads of departments on the work of the station and the various substations, and a financial statement for the biennium ended June 30, 1925. The experimental work reported is for the most part abstracted elsewhere in this issue.

Summary of publications, B. C. PITTMAN (*Utah Sta. Circ. 62 (1926), pp. 4*).—This contains summaries of publications of the station issued since September, 1925, including abstracts of scientific and technical papers published outside the station series.

NOTES

Arizona University and Station.—Recent appointments include Miss Maude E. Jenkins as assistant professor of home economics beginning September 1 and William F. Dickson as assistant animal husbandman beginning October 1.

Delaware Station.—G. M. Gilligan has been appointed assistant chemist, beginning October 15.

Florida University and Station.—M. R. Ensign, truck entomologist and pathologist for the extension division, has been appointed truck horticulturist of the station. Dr. Leonard W. Gaddum has been appointed assistant in home economics investigations. E. W. Cowan has resigned as assistant chemist and has been succeeded by O. M. Berg.

Massachusetts Station.—An isolation and quarantine stable is being built on the college farm to give much-needed facilities for the study of bovine diseases. The station equipment is also being increased by the addition of a dwelling house, office building, and laboratory on an adjoining farm to care for the expanding work in the study of genetics in poultry. This building is to be occupied this fall.

During the past summer new buildings have been erected at the Cranberry Substation at East Wareham to replace those destroyed by fire March 30. These buildings are of cement-block construction, nearly fireproof, and give enlarged facilities for the work of the substation. The auditorium has been increased in size to meet the needs of the growing numbers attending the summer meetings of the State cranberry association, and larger laboratories are also available.

Michigan College and Station.—A new chemical laboratory to cost $600,000 is under construction and is expected to be ready for occupancy by the summer of 1927. It is a three-story building of collegiate Gothic architecture in the form of a letter H. The agricultural chemistry laboratories will be located on the third floor.

R. Wayne Newton has been appointed research associate in economics.

Rutgers University.—The short course in general agriculture has been broadened to include instruction in horticulture and poultry raising.

A. F. Mason, extension specialist in fruit growing, has resigned to take up graduate work at the University of Maryland, and has been succeeded by Dr. A. L. Pierstorff, beginning September 1.

Ohio State University and Station.—William R. Sears, professor of landscape architecture in the university, has resigned. K. H. Myers has been appointed assistant farm management demonstrator.

Erection of the new animal husbandry building at the station is under way.

Oklahoma College.—According to a note in *School and Science*, a foundation of $100,000 has been established by Lew Wentz of Ponca City for loans to students of the college and the State university at a low rate of interest.

Utah College.—*Science* notes that Dr. W. W. Henderson has been appointed professor of entomology and Dr. F. B. Wann associate professor of botany.

West Virginia Station.—Dr. Ruth Buchanan resigned as research home economist October 1 and has been succeeded by Miss Hazel Cameron.

EXPERIMENT STATION RECORD

Vol. 55 November, 1926 No. 7

Bearing the title of Research and the Land, an account of recent progress in agricultural and horticultural science in the United Kingdom has just been published which should prove widely useful both at home and abroad. This account is issued by the Ministry of Agriculture and Fisheries of Great Britain in conjunction with the Board of Agriculture for Scotland and the Ministry of Agriculture for Northern Ireland. It supplements a similar publication prepared about five years ago, bringing approximately to date in conveniently summarized form the more important of the newer achievements in these countries in the various fields of agricultural science.

The period thus reviewed has been one of considerable development in the United Kingdom. An appendix to the publication lists as now in operation 18 research institutions and 14 advisory centers in England and Wales, 5 research institutions and 3 advisory centers in Scotland, and 7 research divisions of the Ministry of Agriculture for Northern Ireland. Approximately £400,000 of public funds is being expended annually by these institutions, and the scientific personnel of the research institutes alone includes well over 100 workers, mostly on a full-time basis. When it is recalled that at the time of the passage of the Development Act of 1909 the entire Treasury grants for higher education in agriculture in England and Wales aggregated less than £13,000, and that substantially all of this amount was devoted to instruction, the change in attitude toward research becomes more readily appreciated.

An additional conception of the activity of these institutions is afforded by a list of the titles of papers published by members of their staffs during the years 1922 to 1925, inclusive. These papers numbered 1,146 and covered a wide range of subject matter. Grouped by institutions they reveal as the heaviest contributor the Rothamsted Experimental Station, credited with 182 papers. Among others may be mentioned the National Institute for Research in Dairying with 80 papers, the South Eastern Agricultural College at Wye with 72 papers, and the Rowett Research Institute of Scotland with 64 papers. Some of these articles are more or less popular in nature, but a goodly proportion are original contributions.

The plan followed in the presentation of material in the book, which embraces nearly 400 pages, is a division into 30 chapters, each dealing with what has been accomplished in some phase of investigation. Thus 7 chapters deal with soil problems, 6 with plant breeding, 1 with plant growth, 4 with the growing and preserving of horticultural crops, 3 with plant diseases and animal pests, 4 with animal feeding and breeding, 2 with dairying, and 1 each with animal diseases, agricultural engineering, and the economics of agriculture. The work under each topic has been further subdivided to show what has been accomplished by each institution.

The extensive work with soils has dealt with such matters as soil colloids and the movement of water in soils, soil cohesion and friction as influencing resistance to cultivating implements, the classification of soil types, soil fertility and the investigation of phosphatic fertilizers, soil sourness, organic matter in the soil, and the life in the soil. Much of this work is centralized at Rothamsted, the pioneer in the field, but important results are also reported from Aberdeen, Edinburgh, Glasgow, Bangor, Belfast, Cockle Park, Seale Hayne, Armstrong College, Leeds, and Oxford.

The chapters on plant breeding indicate the large volume of work which is under way, the substantial results which are being obtained in numerous directions, and the increasing degree to which the improved sorts are finding their way into farm practice. The breeding work at Cambridge, Aberystwyth, Belfast, and the newly-established Seed and Plant Registration Station of the Board of Agriculture at Corstorphine, Scotland, is reviewed in especial detail.

Studies dealing with plant growth are largely centralized at the Imperial College of Science at South Kensington, but reference is made to considerable work at Rothamsted on the effect of fertilizers and growth stimulants and at Aberystwyth on seed germination and seedling growth and the effect of length of day on plant growth. The latter question has received special attention at South Kensington, as has also that of the application of electricity to crops.

Under fruit growing, research on rootstocks and root influence and the relations of scion and stock conducted at Long Ashton and East Malling is described quite fully, as are also studies on the manuring of fruit trees, nutritional disorders, and the influence of pruning from the same institutions. Under what are termed glasshouse crops, the work at the research station at Cheshunt, including the effect of carbon dioxide, is set forth, and studies with strawberries and willows at Long Ashton and with bulbs at the Isles of Scilly Experimental Station are briefly noted. There is also a chapter on the cider-making experiments at Long Ashton, the fruit and vegetable preserving research of the Campden Experimental Station, and

the investigations in fruit and vegetable storage at the low temperature research station at Cambridge and the Imperial College of Science.

The plant disease service of the United Kingdom, it is stated, "has reached a high level of efficiency, and probably in no other branch of agricultural science has research secured such a large measure of practical results." Much of the work in England and Wales is centered at the Pathological Laboratory of the Ministry of Agriculture and Fisheries at Harpenden. The fundamental investigations at the various research institutes and advisory centers are divided into two broad groups, one dealing with the actual living phenomena of fungi and the question of immunity and the other with the more practical matter of perfecting methods of plant disease control. These studies are widely distributed, but with special provision for their prosecution at Rothamsted, South Kensington, East Malling, and Long Ashton.

The entomological work is carried on in some cases at research institutes and at others by an advisory officer at a university or agricultural college. Among the centers may be mentioned East Malling, Wye, South Kensington, Manchester, Rothamsted (including beekeeping), Oxford, Aberdeen, and Glasgow.

The Animal Nutrition Institute at Cambridge, the Rowett Research Institute at Aberdeen, and the division of chemical and animal nutrition of Queen's University at Belfast are the centers of research in animal nutrition in their respective countries. The Cambridge institute with its respiration calorimeter is working especially on the requirements of young animals, while the Rowett Institute has given particular attention to the importance of the mineral constituents in various classes of livestock and the influence of ultra-violet rays. Special mention is made of the "harmony of working" between these two institutions, as well as to the "very enthusiastic spirit of cooperation which exists amongst animal nutrition workers in all spheres."

It is at Cambridge, too, that much of the animal breeding work is centered, while in Scotland this function is performed by the animal breeding research department of Edinburgh University. The Cambridge work deals especially with small animals, much being done with poultry and rabbits, while at Edinburgh some of the more practical genetics work has been carried on with sheep.

As compared with other branches of agricultural science it is stated that research in dairying has been given surprisingly little attention. Only within the four-year period under review has the National Institute for Research in Dairying at Reading been provided with a farm and its own dairy herd. Attention has been

given mainly to the problem of clean milk and to the questions of production more immediately affecting the dairy farmer, but increasing opportunities are being found for studies in this and other institutions of the nutrition of the dairy cow, the physiology of milk secretion, and the manufacture of milk products.

Animal disease research is another field which has been materially enlarged. In England a new institute has been established at Cambridge, and the scope of the research of the Royal Veterinary College has been extended and new buildings provided. The London School of Hygiene and Tropical Medicine and the Animal Disease Research Association of Scotland have been given increased facilities, and accommodations have been provided in the laboratories of the Ministry of Agriculture for Northern Ireland. There is also a joint commission of human and animal pathologists, appointed by the Government, which is studying foot-and-mouth disease. Other diseases at present under investigation are joint ill in foals, Johne's disease, epizootic abortion, mastitis in cows, scrapie in sheep, liver rot, braxy, louping ill, and lamb dysentery.

Agricultural engineering is the last branch of agricultural science to receive State aid, a research institute having been opened at Oxford University in 1924. Considerable preliminary work had been done, however, by the Ministry of Agriculture and Fisheries in drainage and subsoiling, and these phases continue to receive attention. Dehydration, particularly as applied to the artificial drying of hay and grain crops, sugar beet extraction processes, and the generation of electricity by windmills are leading topics of inquiry at present.

Increasing interest since the World War is reported in the problems of agricultural economics. In consequence, the staff of the research institute at Oxford has been strengthened and within the past two years specialists have been appointed in several agricultural colleges to work in close cooperation with it, and a marketing and cooperation branch of the Ministry of Agriculture and Fisheries has been established. Cost accounting, the maintenance of arable farming, and marketing and cooperation have been studied in more or less detail, and numerous farm surveys modeled on the American plan have been undertaken at various points. There is a strong feeling, reflected in the closing words of the book, that the important requirement at present is the collection of data on which sound advice and policy can be built. The view is expressed that "even if the results of the inquiry may not be of immediate help to the farmer in increasing his profits or diminishing his losses, they will certainly widen his vision of the farming outlook, and they will form yet an-

other contribution to the creation of an enduring policy for agriculture."

The foregoing summary makes no pretense of completeness, but is presented merely as an explanation of the scope of the book and an indication of some of the lines along which agricultural research is progressing in the United Kingdom. It is apparent that this work is steadily becoming more and more effectively organized, and that increasing attention is being given to fundamental matters as well as those of immediate concern to farmers. The strong popular support which is being accorded this policy makes the outlook for the future especially encouraging.

The recent publication of the Hitchcock lectures at the University of California for 1924 has served to make more generally available an authoritative English interpretation of the current status of knowledge of plant nutrition and crop production. The Hitchcock Lectureship was established in 1909 through private funds to give the public the benefit of lectures on "popular and scientific subjects," and has been the means of bringing to the university some eminent authorities in various fields of science. The appointment to the 1924 Lectureship of Sir John Russell, director of the Rothamsted Station, was the first to relate to agriculture, and was at once a recognition of the importance of the subject and its progress in recent years and of the lecturer himself, who, as the writer of the foreword to the printed lectures puts it, "embodies in his personality the characteristic type of ability and industry which the agricultural science of this century represents."

The lectures as here presented are five in number, dealing in turn with the study of plant nutrients, positive science and exact demonstration, decay and the living plant, the soil microorganisms, and the soil and the living plant. It is hardly necessary to state, however, that these topics are treated broadly, so that one outstanding result is a unique and very useful discussion of the research method as applied to agriculture.

As an example of the inspirational value of the work, reference may be made to a passage which concludes the initial chapter. After reviewing the history of investigations of plant nutrition problems, the statement is made that "the whole problem is now back again in the laboratories for reinvestigation to obtain if possible a closer approximation to the truth. We shall find this to be the usual course of events. The first workers obtain much knowledge rapidly; then comes a period when progress apparently ceases and confusion reigns instead. Suddenly the generalization appears and sooner or later

thereafter the practical application. Then comes the large-scale test, the criticisms, and the curious and inexplicable observations of the practical grower. And although we who are working in the experimental stations may sometimes be tempted to feel that these observations, being unknown to us, can not possibly be true, nevertheless they often are true and contain the germ of highly interesting scientific problems, sometimes indeed the key to further progress. . . . But progress is always slow, and we can never see the whole of anything in Nature; as Browning said, we explore with a taper and not with a torch."

Or again, at the end of a discussion of the manifold changes going on in the soil during the process of crop production, it is pointed out that "the crop growing in the field is the resultant of all these various actions. Obviously it is beyond human ability to put all these factors together and predict the result. But the investigations have shown what the factors are, and have given much knowledge about the soil and the growing plant. Already some of this has been applied to the problem of lightening the farmer's tasks and increasing his yields. But its value goes far beyond this purely materialistic end: It has furnished the teacher with principles and facts that he can utilize for drawing up a sound system for training the young people in the countryside, and it has shown to the countryman something of the infinite wonder of the things he handles daily."

In conclusion, this message is given: "The past has been rich in the joys and thrills of discovery; but it has taught this lesson: That discoveries in applied science inevitably follow advances in pure science. If we would improve our agriculture the surest way is to increase knowledge of the soil, the plant, and the animal. Empirical methods, it is true, have often given advances in the past, but they are slow, hesitant, and uncertain; dependent on accident. Exact knowledge is the only sure basis for improvements; encourage, therefore, those among you who are striving to win it."

As a whole, the lectures have much value as a convenient and competent review of existing knowledge. Perhaps an even greater service, however, will be rendered by their idealism and the consequent inspiration to renewed endeavor which they so characteristically provide.

Another recent contribution from the Rothamsted Experimental Station has unique interest for all students of agricultural history. This is a catalogue of the printed books on agriculture contained in the Rothamsted Library which were published between the years 1471 and 1840. In addition to the usual bibliographical information, notes on many of the books and authors are appended, and as

a preface by the director puts it, these "form a running commentary on agricultural history which gives to the volume an interest that ordinary catalogues necessarily lack."

The period covered by the catalogue is determined by two turning points in the long history of agriculture. It was in 1471 that the first printed book on this subject, the Liber Ruralium Comodorum of Petrus Crescentius, was sent out from Augsburg—"a magnificent folio printed from beautiful type with elaborate capital letters drawn and gorgeously colored by hand." The year 1840 likewise marks a definite stage in agricultural history. "Up till then," says Sir John Russell, "agriculture and agricultural books were almost exclusively empirical. Fortunately, however, not entirely; all through one finds writers who strove to get beyond the empirical facts and to discover the underlying principles. Their efforts, small and disconnected at first, can be traced like a growing stream throughout the long period to the closing forty years in which were crowded the achievements of the Geneva school of plant physiologists: De Saussure, Senebier, and others; the application of chemistry to agriculture by the English chemist Davy; the wider application of science to farm problems; and, still more important, the development of experimental methods of studying agricultural problems by the founder of modern agricultural science, Boussingault. Finally, with dramatic suddenness all this work burst into fruition when, in 1840, Leibig brought together the results of the earlier workers and deduced from them the simple laws of husbandry with which his name will always be associated; at the same time Lawes made the pot experiments which, within the next three years, were to lead to the founding both of the Rothamsted Experimental Station and of the artificial fertilizer industry. Up to 1840 agriculture had been based on empirical rules; after 1840 it was developed on scientific principles."

Covering as they do the empirical period in agriculture, the volumes listed contain much of the lore and wisdom of practical farmers always held in high repute in the countryside. In them too may be traced the origin and development of ideas and practices which have been handed down to our own times and which have made a more or less definite impress upon our development.

As would be expected, the bulk of the books are by English authors, beginning with The Boke of Husbandry of FitzHerbert, which probably antedated 1534. Another early book to be included is the first treatise on poultry, with the following expressive title: A Discourse of Housebandrie: No Lesse Profitable than Delectable, Declarying . . . the Housebandrie, or Rather Housewiferie of Hennes.

This was written in French by Prudens Choiselat and translated into English in 1580. Others which may be mentioned as pioneers in their respective fields are Thomas Hill's The Arte of Gardening and A Profitable Instruction of the Perfite Ordering of Bees, both published in 1586; England's Improvement Revivd, by John Smith in 1670, the first book to give data on cost of production; and what is stated to be the first attempt to found a scientific agricultural journal, A Collection of Letters for the Improvement of Husbandry and Trade, by John Houghton, 1681–1683.

The publications catalogued from North America number only nineteen, and many of these are general treatises in which the references to agriculture are more or less incidental. Among the earliest in point of original issue is a reprint of a book written by Thomas Glover in 1676 entitled An Account of Virginia, Its Scituation, Temperature, Productions, Inhabitants, and Their Manner of Planting and Ordering Tobacco. Another appearing anonymously and bearing the date 1775 is entitled American Husbandry, Containing an Account of the Soil, Climate, Production, and Agriculture, of the British Colonies in North America and the West Indies. The best known work of the period contained in the collection is doubtless the 1801 edition of the letters from Washington to Arthur Young upon agricultural matters.

Within the past twelve years, the Rothamsted collection as a whole has been greatly augmented, and while not complete it has become one of the foremost agricultural libraries of the world. This catalogue deals with many books not accessible elsewhere. In preparing and publishing it, the Rothamsted Station has increased the availability of its facilities in a very practical and helpful way, and has contributed materially to a stimulation of historical research in agriculture.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Annual reports on the progress of chemistry for 1925, edited by C. SMITH (*Ann. Rpts. Prog. Chem.* [*Chem. Soc., London*], *22* (*1925*), *pp. X+11–400, pl. 1, fig. 1*).—This is the customary annual report (E. S. R., 53, p. 711).

The isoelectric theory: Its application to certain problems of crop products manufacture and soil fertility, I–VI (*Trop. Agr.* [*Trinidad*], *2* (*1925*), *Nos. 8, pp. 179–181; 9, pp. 208, 209; 10, pp. 231–233; 11, pp. 256–258; 12, pp. 283–285; 3* (*1926*), *No. 1, pp. 14–16*).—The first five of this series of papers by F. Hardy deal, respectively, with the general idea of the isoelectric theory and its bearing on the precipitation of hydrophilic colloids by electrolytes, the application of the theory to the coagulation of rubber latex, its application to defecation processes in cane sugar manufacture, its application to cacao fermentation, and the mechanism of flocculation in colloidal soils. The final paper by P. E. Turner completes the discussion of reactions in colloidal soils by a discussion of soil fertility and the effects of fertilizers.

The pectic substances, W. H. DORE (*Jour. Chem. Ed., 3* (*1926*), *No. 5, pp. 505–513*).—This is a review of recent work on pectins, with a discussion of the application of this work to the rôle of pectins in plant life, their value in animal nutritition, and their possible commercial applications.

Concentrated antineuritic vitamin prepared from brewers' yeast, A. SEIDELL (*Jour. Biol. Chem., 67* (*1926*), *No. 3, pp. 593–600*).—A method of obtaining an antineuritic vitamin concentrate from brewers' yeast on a large scale and in the form of a stable, dry, nonhygroscopic powder is described. The various steps of the process, which is similar in many respects to the one previously described (E. S. R., 49, p. 611), are summarized as follows: "Removal of the yeast protein by boiling, adsorbing the vitamin from the resulting solution by means of fullers' earth, extracting the activated solid with sodium hydroxide, acidifying and concentrating by vacuum distillation, removing the sodium as $Na_2SO_4.10H_2O$ and the nonactive organic material by means of methyl alcohol, finally converting the active viscous residue to a nonhygroscopic dry powder by treatment with strong ethyl alcohol."

From pigeon feeding tests it is estimated that approximately one-third of the total vitamin contained in 5 kg. of activated solid is found in about 150 gm. of the nonhygroscopic powder. The losses of active material are attributed to the impossibility of liberating all of the vitamin from its combination with fullers' earth, the destruction of the vitamin by the various treatments to which the solutions are subjected during the process, and the impossibility of separating the vitamin completely from the inactive fraction by the present method.

A buffer mixture for the alkaline range of hydrogen ion concentration determinations, W. R. G. ATKINS and C. F. A. PANTIN (*Biochem. Jour., 20* (*1926*), *No. 1, pp. 102–104*).—On account of the difficulty in preparing carbonate-free sodium hydroxide as required for the Sörensen and Clark and Lubs

buffer mixtures and the absorption errors involved in its use, the authors recommend the use of sodium carbonate solutions instead of sodium hydroxide.

For use between pH 7.8 and 10.8, the following solutions are recommended: (1) M/5 boric acid made M/5 with respect to potassium chloride as well. One liter should contain 12.4048 gm. boric acid (using 11 as the atomic weight of boron) and 14.912 gm. of potassium chloride. (2) M/5 sodium carbonate, 21.2000 gm. per liter, prepared in the anhydrous form from the bicarbonate. A table is given of the proportions of the two solutions to use for pH values differing by 0.2 and of the pH values of various mixtures of the two solutions in multiples of 5. At values below pH 9.6 thymol blue and xylenol blue are both considered satisfactory indicators. Above this phenolphthalein is recommended to pH 10.5 and beyond this alizarin yellow G, which is *p*-nitrobenzene-azo-salicylic acid.

Determination of total nitrogen in plants and plant solutions: A comparison of methods with modifications, E. R. RANKER (*Ann. Missouri Bot. Gard.*, *12* (*1925*), *No. 4*, *pp. 367–380*, *pl. 1*).—Irregularities in results obtained in the determination of total nitrogen in plants and plant solutions by the Official salicylic thiosulfate method are shown to be due chiefly to the presence of water in the sample being analyzed. To avoid this source of error a modification of the method is proposed which differs from the original chiefly in that the sample, after being placed in the Kjeldahl flask and adjusted to neutrality or slight alkalinity, is evaporated to dryness on a water bath under vacuum. In the presence of organic matter it is considered essential to let the digestion mixture stand overnight at room temperature in the flask, which should be tightly corked. This is said to prevent foaming on subsequent heating.

The technique of the modified method is outlined, together with certain details of manipulation which have been found of value, and previous literature on the subject is discussed. Analyses by the modified method and the Devarda method of samples containing amino-, amide-, ammonia-, nitrate-, and total plant-nitrogen are reported, with the conclusion that the new method is approximately twice as rapid and just as accurate as the Devarda method. If sugar is present in abundance a slight loss of nitrate nitrogen may occur.

Fat solvents, C. E. BILLS (*Jour. Biol. Chem.*, *67* (*1926*), *No. 1*, *pp. 279–285*).—In the first series of experiments reported, 250 organic liquids were tested for miscibility with pure cod-liver oil in equal proportions. The 28 liquids proving immiscible were then tested for miscibility with white coconut oil, raw linseed oil, refined olive oil, and filtered butterfat specially prepared without artificial coloring. Eight of the liquids proved miscible with one or more of these fats, and several of them showed various color reactions with the different fats. It is suggested that the term fat solvent can not be applied with reference to all fats.

The importance of clearing the hydrolyzed solution in the determination of acid-hydrolyzable carbohydrates in green plant tissue, V. H. MORRIS and F. A. WELTON (*Jour. Agr. Research* [*U. S.*], *33* (*1926*), *No. 2*, *pp. 195–199*).—Comparative results are reported for the determination of acid-hydrolyzable carbohydrates in various types of green plant tissue by a modification of the Quisumbing-Thomas method (E. S. R., 46, p. 113), with and without clearing the hydrolyzed solution before determining its reducing power.

The data reported indicate that with alcohol-preserved samples of green plant tissue it is unnecessary to clear the hydrolyzed solution, but that it is essential to keep the reaction of the solution on the acid side in the presence of the lead solution. It is noted that with some plant materials the precipitate of cuprous oxide obtained without preliminary clearing is in a more finely divided state,

but this is thought to offer no disadvantage provided the precipitate is centrifuged instead of filtered.

A new method for the identification and estimation of cholesterol and certain other compounds, J. V. STEINLE and L. KAHLENBERG (*Jour. Biol. Chem.*, 67 (1926), No. 2, pp. 425–467).—The reaction between cholesterol and antimony pentachloride observed in a previous study (E. S. R., 47, p. 805) has been made use of in the development of a method for the colorimetric estimation of cholesterol.

With a dilute solution of cholesterol, a chloroform solution of antimony pentachloride forms a muddy brown precipitate, which upon solution in more chloroform yields a clear purple liquid quickly changing to a cobalt blue upon exposure to light. The color is very stable at low temperatures in the dark and fairly stable upon heating. The compound forming the blue color in chloroform may be obtained in pure form by washing the muddy brown precipitate free from excess of both cholesterol and antimony pentachloride by means of carbon tetrachloride. The reaction can thus be used for the quantitative estimation of cholesterol, and has also been found to be quantitative for phytosterol.

In testing various oils and other substances with the antimony pentachloride reagent, it was found that the vegetable oils, on account of their high content of unsaturated fatty acids, form a brown color. Hydrogenated oils and animal oils high in cholesterol and low in unsaturated fatty acids show the blue cholesterol reaction. Isocholesterol and esters of cholesterol also produce the blue color, but lipoids do not.

A modification of the calcium pectate method for the estimation of pectin, A. M. EMMETT and M. H. CARRÉ (*Biochem. Jour.*, 20 (1926), No. 1, pp. 6–12).—This modification of the Carré-Haynes method of determining pectin as calcium pectate (E. S. R., 47, p. 610) consists in first precipitating the pectin with acidified alcohol, which unlike neutral alcohol has been demonstrated to bring about a quantitative precipitation of the pectin. The precipitate is then washed with acidified alcohol, dissolved, and reprecipitated as calcium pectate as in the original method. The modification is of particular value in the case of pectin solutions containing substances precipitable by calcium, such as oxalates.

A rapid method for determining the gasoline color value of flour and wheat, D. A. COLEMAN and A. CHRISTIE (*Cereal Chem.*, 3 (1926), No. 2, pp. 84–89, figs. 2).—The method involves the use of a mechanical stirrer of the type used in soda fountains, the evaporation of the gasoline being prevented by covering the sample bottle with a specially designed metal cap. Results agreeing very closely with those obtained by the Official method requiring 24 hours are said to be possible with the new device by using a 20-gm. sample of flour in 100 cc. of gasoline and stirring for 30 minutes. Fair agreement is possible with a 5-gm. sample stirred for 15 minutes. The comparison is made with a standard 0.005 per cent potassium chromate solution in the usual way, except that the tube is adjusted to the 4-cm mark for 5-gm. samples and to the 1-cm. mark for 20-gm. samples.

The method is also recommended for determining the gasoline color value of wheat samples, the wheat being so ground that 75 per cent of it passes through a No. 50 grits gauze.

Control of diastatic activity in wheat flour.—I, Production of diastatic flour and effect of large dosages, R. C. SHERWOOD and C. H. BAILEY (*Cereal Chem.*, 3 (1926), No. 2, pp. 107–136, figs. 2).—The object of this investigation, of which this is a preliminary report, was to supplement diastases naturally occurring in wheat by the addition in the milling process of wheat which had

been allowed to germinate for a short time under control, the amount added varying with the original diastatic power of the wheat. In the first test 2,000-gm. portions of wheat containing different percentages of germinated wheat were milled and tested for the yield of various fractions, diastatic activity, protein changes, baking qualities, H-ion concentration, and titratable acidity. Later the tests were repeated on a commercial scale. The results reported are summarized as follows:

"It has been shown that diastatic activity can be increased by the addition of germinated wheat; in fact, can be carried beyond the range which present knowledge indicates is satisfactory from the baking standpoint. The length of the germinating period was found to be important. A small quantity of wheat germinated for 5 days was much less desirable than two or four times that quantity of wheat germinated 3 days. Large quantities of germinated wheat reduced the baking value, probably very largely because of the activity of proteases which were unavoidably contributed with the diastases, or to the presence of a relatively large proportion of partially hydrolyzed gluten. There is evidence that protease activity is not so marked in wheat germinated for the shorter period."

Effect of mono calcium phosphate upon the viscosity of acidulated flour-in-water suspensions, L. EARLENBAUGH (*Cereal Chem., 3 (1926), No. 2, pp. 102–106*).—Various quantities of monocalcium phosphate were blended with three flours of widely varying quality and determinations then made of the viscosity and quality factors of the flours.

The addition of the phosphate was found to lower the viscosity of the flour-in-water suspension, but to bring about no appreciable change in the quality factor. Baking tests conducted on the different samples showed that only one of the three flours, a 100 per cent flour milled from high protein hard winter wheat could be phosphated to good advantage. The third flour, a soft wheat patent flour, yielded very poor loaves when phosphated. For biscuit making phosphated flour of this type is said to give better results than unphosphated.

The ash content of the suspensions of phosphated flours was in all cases higher than of the plain flour. This is thought to indicate that the phosphate ion must have entered into combination with the protein.

Some observations on the freezing point of milk, J. H. BUCHANAN and O. E. LOWMAN (*Jour. Dairy Sci., 9 (1926), No. 2, pp. 192–202, figs. 3*).—A study of the effect of dissolved substances in water used for adulteration and of seasonal variations in the milk upon the cryoscopic index of milk as determined by the Hortvet method (E. S. R., 45, p. 506) is reported with the following conclusions:

"Equal volumes of distilled water and natural water of considerable hardness when added to milk give the same freezing point depression as detected by the cryoscopic method. Magnesium chloride solutions containing at least 1,519 parts per million may be added to milk without affecting the detection of the water in the solution by the cryoscopic method. Concentrations as great as 3,189 parts per million counteract the effect of 1.9 per cent added. Greater concentrations counteract correspondingly greater quantities of water. Concentrations of sucrose in solution as great as 5,060 parts per million may be added to milk without affecting the detection of the water of the solution by the cryoscopic method; 15,180 parts per million counteracted the effect of 1.2 per cent added water. There is a tendency for the freezing point of milk from the same herd to lower as the season advances from spring through the summer. There is no correlation between the pH values and the freezing points of the milk during these seasons."

Sweetened condensed milk.—IV, A refractometric method for determining total solids, F. E. RICE and J. MISCALL (*Jour. Dairy Sci., 9 (1926), No. 2, pp. 140–152*).—In this continuation of the studies previously noted (E. S. R., 55, p. 504), the refractometric method of determining total solids has been applied to condensed, whole, and skim milk, with results indicating that the refractive power of condensed milk follows the general law of true solutions and that consequently the method can be safely used for the estimation of the total solids of condensed milk. Formulas have been derived by means of which the total solids of any sample can be determined from the refractive index. From these formulas tables have been prepared from which total solids can be read directly from the refractive index. These formulas and tables are shown to hold even if the sucrose content varies within wide limits, but not to be accurate if the fat varies very much from the percentage for which the tables have been prepared.

The refractometric method is also considered to be applicable to the determination of the finishing point of batches in the factory.

A new method for the estimation of alkali with special application to wool, H. R. HIRST and A. T. KING (*Jour. Textile Inst., 17 (1926), No. 2, pp. T94–T100*).—The method described involves the removal of the alkali from the wool as a solution of sodium terephthalate by placing the wool in water containing terephthalic acid in suspension and its estimation either gravimetrically or volumetrically. Data are presented showing that the method gives quantitative results for the total alkali in wool whether present as caustic soda, sodium carbonate, or soap. When calcium salts are present a separate estimation of the calcium is necessary.

The estimation of sulphuric acid in wool, H. R. HIRST and A. T. KING (*Jour. Textile Inst., 17 (1926), No. 2, pp. T101–T103*).—The terephthalic acid method of estimating alkali noted above has been found equally applicable to the estimation of sulfuric acid in wool. A measured volume of standard sodium terephthalate solution is added to the moistened sample. The material may be heated in the sodium terephthalate solution at 60° C. for 15 minutes and allowed to stand for 3 hours before filtering, or left unheated overnight. The procedure is then carried out as in the alkali determination. It is stated that no complications are introduced by the presence of soap acids or small quantities of calcium or magnesium sulfate.

The determination of sugar in blood and in normal urine, O. FOLIN (*Jour. Biol. Chem., 67 (1926), No. 2, pp. 357–370*).—On the basis of suggestions in Benedict's new technique for determining blood sugar (E. S. R., 54, p. 10), the author has modified the alkaline copper tartrate and acid molybdate solutions employed in the Folin-Wu method and compared the modified method with the original and with Benedict's new method on samples of normal blood.

Although certain features of the Benedict method are criticized, it is admitted that the present study has "in the main confirmed his analytical findings, and has also in the main verified the correctness of his working theory that the sugar method which gives the lowest sugar values when applied to urine, if it is at the same time dependable for glucose, will give blood sugar values which correspond most nearly to the glucose content of blood."

The determination of iron in blood, tissues, and urine, F. S. FOWWEATHER (*Biochem. Jour., 20 (1926), No. 1, pp. 93–98*).—The basis of the methods described is the thiocyanate method in the presence of acetone as suggested by Marriott and Wolf (E. S. R., 18, p. 523). For the determination in blood, the procedure of Wong (E. S. R., 49, p. 113) is followed quite closely except for the acetone modification as described by Berman (E. S. R., 39, p. 507) and the use of perhydrol in place of sodium or potassium chlorate as in the Wong

method. "'Perhydrol' has two advantages over chlorate, namely, that it leaves no residue, and that the steady evolution of oxygen which results from its addition insures steady ebullition, thus avoiding the possibility of loss by spurting which we have found to be a real danger in Wong's method."

The method for tissues differs from the usual methods in that in place of complete oxidation by ignition or by sulfuric and nitric acids, a partial destruction of the organic matter is brought about by sulfuric acid, followed by the complete oxidation of the remaining organic matter in an aliquot portion of perhydrol. The determination is then finished as in the case of blood.

With urine the oxidation is conducted as with blood, but after the complete oxidation by perhydrol strong heating is continued for at least 3 minutes until practically all of the sulfuric acid is driven off. This is done for the purpose of converting the orthophosphoric acid into metaphosphoric acid, which causes less interference with the development of the color. The presence of acetone is considered particularly essential for tissues and urine.

The technique for the three materials is described in detail, and data are presented showing that the methods are capable of a high degree of accuracy. They are said to be more simple and less time consuming than the methods in use at present.

Iron in nutrition.—II, Quantitative methods for the determination of iron in biological materials, C. A. Elvehjem and E. B. Hart (*Jour. Biol. Chem., 67 (1926), No. 1, pp. 43–51*).—In continuation of the investigation previously noted (E. S. R., 54, p. 293), the authors have examined several methods of determining iron in organic materials, including the Thomson method recommended by the American Public Health Association in their standard methods for the examination of water and sewage and Walker's modification of this method (E. S. R., 55, p. 12). The first of these was found satisfactory for materials relatively high in iron and low in phosphorus, such as lettuce, grains, and hay, and the second for materials somewhat rich in phosphorus, such as cabbage. For materials which are relatively low in iron and high in phosphorus another modification of the Thomson method was adopted, which is essentially as follows:

The phosphorus is first removed from the solution by precipitation with ammonium molybdate. The filtrate is then treated with potassium hydroxide, which precipitates the iron as ferric hydroxide along with calcium and magnesium hydroxides. The precipitate is filtered off on a spongy platinum Gooch or acid-washed asbestos Gooch crucible, and the iron determined colorimetrically after dissolving in hydrochloric acid.

A study of the molybdic oxide colorimetric method for the estimation of the phosphorus compounds of the blood, J. H. Roe, O. J. Irish, and J. I. Boyd (*Jour. Biol. Chem., 67 (1926), No. 3, pp. 579–584, fig. 1*).—The authors discuss various modifications of the molybdic oxide colorimetric method for determining phosphorus and describe the technique which they have found most satisfactory. This is essentially as follows:

Two cc. of whole blood is pipetted into a 25-cc. graduated cylinder or volumetric flask partly filled with phosphate-free water, made up to the mark with water, and mixed thoroughly. Two cc. of this mixture and 1 cc. of a mixture of 7 parts of concentrated sulfuric acid and 3 of nitric acid are placed in a 20 by 200 mm. graduated test tube and heated in a temperature-controlled bath at 180° C. for 20 or 30 minutes, or until all the water has been driven off and a brownish charred mixture remains. Redistilled superoxol is then added from a pipette a drop at a time until all of the water vapor is driven off. The process is repeated until the mixture becomes clear, after which the tube is heated for 15 minutes longer, removed, cooled, and diluted with 10 cc.

of water. To the contents of this tube, and another in which had been placed 10 cc. of standard phosphate solution containing 0.05 mg. of phosphorus to 0.5 cc. of concentrated sulfuric acid, are added 1 cc. of 5 per cent ammonium molybdate and 1 cc. of 0.5 per cent hydroquinone in 15 per cent sodium bisulfite solution. Both tubes are placed in a boiling water bath for 10 minutes, removed, and cooled. The standard is diluted to 25 cc. and the unknown to a volume that will give a color approximately matching the standard, and the color comparison is then made in a colorimeter in the usual way.

A colorimetric method for the estimation of blood calcium, J. H. Roe and B. S. Kahn (*Jour. Biol. Chem., 67 (1926), No. 3, pp. 585–591, fig. 1*).—In the method described the calcium is precipitated as calcium phosphate from an alkalinized trichloroacetic acid serum filtrate and estimated as phosphate by a slight modification of the Benedict-Theis molybdic oxide colorimetric method (E. S. R., 52, p. 613), essentially as described in the paper noted above. Two cc. of blood serum, 4 cc. of distilled water, and 4 cc. of 20 per cent trichloroacetic acid are mixed thoroughly in a small flask, allowed to stand for 10 minutes, and filtered through a double acid-washed calcium-free filter paper. Five cc. of the filtrate is transferred to a thoroughly clean 15 cc. conical centrifuge tube, and to this is added 1 drop of 1 per cent phenolphthalein, followed drop by drop by 20 per cent calcium-free sodium hydroxide until a definite pink color is obtained. One cc. of 1 per cent trisodium phosphate is added, and after thorough mixing of the contents the tube is corked, set aside for an hour, and then centrifuged. The precipitate, after careful washing with two 5-cc. portions of 50 per cent alcohol made alkaline to phenolphthalein, is dissolved in 5 per cent sulfuric acid by volume and decanted into a graduated tube to which are also added washings of the precipitate with 3-cc. and 2-cc. portions of the 5 per cent sulfuric acid. The determination is then made as noted in the above paper, except that the dilution is made to 15 instead of 25 cc.

The method is said to be very accurate and to be more suitable for micro determinations than the other methods in use at the present time.

Titrimetric double hydrogen or quinhydrone electrode systems for hydrion determination; applications to urine and blood, G. H. Meeker and B. L. Oser (*Jour. Biol. Chem., 67 (1926), No. 1, pp. 307–317, fig. 1*).—"A simplified electrometric method for the measurement of hydrogen ion concentration is presented, based on the use of the double hydrogen electrode or the double quinhydrone electrode, in which the potential of the measured solution in one half cell is balanced by titrating standard buffer solutions into the other half cell. The proportions of the latter solutions required to produce equilibrium determine the pH of the unknown solution. Applications of the quinhydrone electrode to the estimation of the pH of urine and blood are described which give results concordant with the colorimetric methods now in general use."

Studies dealing with the lying of corn and the varieties best adapted for hominy making, E. S. Haber (*Amer. Soc. Hort. Sci. Proc., 22 (1925), pp. 353–359*).—Essentially noted from another source (E. S. R., 55, p. 412).

Corn sugar and its uses (*Iowa Agr. Col., Ext. Serv. Home Econ. Bul. 92 (1926), pp. 8*).—This is a collection of tested recipes in which corn sugar (glucose) has been substituted for part of the cane sugar usually used. A brief comparison is included of the essential differences in the physical properties of cane and corn sugar which should be taken into consideration in the use of the latter.

Cocoa by-products and their utilization as fertilizer materials, G. P. Walton and R. F. Gardiner (*U. S. Dept. Agr. Bul. 1413 (1926), pp. 44, figs. 2*).—This publication contains the results of an investigation of the nature and value as fertilizing material of three trade residues produced from cacao

beans—the husks or shells, by-product cocoa press cake, and solvent-extracted cocoa. The production and yield of these by-products are discussed, and data are presented on their composition, particularly with reference to the amount and quality of the nitrogen.

The average calorific value of the press cakes was found to be two-thirds that of good bituminous coal. More than one-third of the total nitrogen of the pressed cake and the solvent-extracted cocoa proved to be water-soluble, but the insoluble organic nitrogen was of inferior quality. The alkaloid nitrogen constituted in some cases from 50 to 60 per cent of the water-soluble nitrogen. The sum of the water-soluble and active insoluble nitrogen was less than the amounts reported in the literature for cottonseed meal and castor pomace. The cocoa press cakes contained about three-fourths as much nitrogen and phosphoric acid and twice as much potash as castor pomace and were similar to commercial cottonseed feed in their crude plant food content. It is suggested that the best utilization of these two products would be, first, to recover the fat; second, to recover the alkaloids; and, finally, to use the defatted-dealkaloidized residue as a fertilizer material.

The shells contained less than three-fourths as much nitrogen, a little less phosphoric acid, and considerably more potash than the average by-product cocoa cake. The quality of the nitrogen was lower than that of the cake and extracted cocoa nitrogen.

A bibliography of 61 titles is appended.

Second report of the adhesives research committee, M. O'Gorman et al. (*London: [Gt. Brit.] Dept. Sci. and Indus. Research, 1926, pp. III+128, figs. 28*).—This includes a brief general report of the committee, together with the detailed reports of special investigations as follows: Investigations on Gelatin, by S. B. Schryver; Investigations on Bone Glues and The Production of Glue and Gelatin from Fish, by J. C. Kernot and N. E. Speer; Adhesives and Adhesive Action, by J. W. McBain and D. G. Hopkins; Mechanical Tests of Adhesives for Timber by the Royal Aircraft Establishment; and The Examination of Glued Joints by X-Rays.

METEOROLOGY

The Weather Bureau and agriculture in the Southwestern States, J. B. Kincer (*Abs. in Bul. Amer. Met. Soc., 7 (1926), No. 5, pp. 70, 71*).—Attention is called especially to temperature surveys by the Weather Bureau in the Salt River Valley and in the lower Colorado River Valley and on the Yuma Mesa, with special reference to citrus growing. The Salt River survey showed that "the normal minimum temperatures for the two coldest months of the year, December and January, vary in different parts of the valley from about 32° to about 40°, with some of the coldest and warmest areas comparatively near each other." The other survey showed that "conditions on the mesa are remarkably uniform, but greatly different from those in the valley, especially as regards the length of the growing season [75 days]."

The present status of long-range weather forecasting, R. DeC. Ward (*Amer. Phil. Soc. Proc., 65 (1926), No. 1, pp. 1–14; abs. in Science, 63 (1926), No. 1635, Sup., p. XII*).—This article discusses various methods which have been used in an attempt to make successful long-time weather forecasts, such as those based on the habits and characteristics of animals, on almanacs, and on sequences in the weather, as well as some which have no scientific foundation. The work of H. H. Clayton, based upon solar observations by C. G. Abbott, is also discussed.

Regarding this basis for forecasting, the author says, "there is no immediate likelihood that the official weather services of the world will use observations of solar radiation for extending the regular periods now covered by their forecasts. . . . If definite and detailed effects upon the weather resulting from given fluctuations of the solar constant could be known in advance, and if any actual variations of solar radiation could also be known in advance, then it seems reasonable to think that definite forecasts, of real economic value, extending over considerable periods of time, would be possible." It is stated that seasonal forecasts based upon variations in the general circulation of the atmosphere have not yet proved entirely satisfactory. "There is, however, promise for the future."

Meteorological conditions along airways, W. R. Gregg (*Natl. Advisory Com. Aeronaut. [U. S.] Rpt. 245 (1926), pp. 16, figs. 8*).—This report attempts to show "the kind of meteorological information that is needed, and is in part available, for the purpose of determining operating conditions along airways."

Climatological data for the United States by sections, [May–June, 1926], (*U. S. Dept. Agr., Weather Bur. Climat. Data, 13 (1926), Nos. 5, pp. [190], pls. 3, fig. 1; 6, pp. [195], pls. 3, fig. 1*).—These numbers contain brief summaries and detailed tabular statements of climatological data for each State for May and June, 1926.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. Ostrander and H. W. and E. H. Wheeler (*Massachusetts Sta. Met. Buls. 451–452 (1926), pp. 4 each*).—The usual summaries and notes are given of observations at Amherst, Mass., during July and August, 1926.

Actual temperatures of South America, M. Jefferson (*Geogr. Rev., 16 (1926), No. 3, pp. 443–466, figs. 28*).—Diagrams are presented and briefly discussed which show "the principal types of weather found in South America as far as themometric—not sensible—temperatures are concerned. The examples have been chosen from a much larger body of data, though there are none included from Venezuela, Colombia, Ecuador, the Guianas, Paraguay, Uruguay, or Bolivia."

Rainfall in Java in 1925 [trans. title], J. Kuyper (*Arch. Suikerindus. Nederland. Indië, 34 (1926), No. 8, pp. 189–198; abs. in Facts About Sugar, 21 (1926), No. 18, p. 418*).—It is stated that "the year 1925 was phenomenally dry in Java, the total average rainfall being 1.456 meters (57.32 in.) compared with the average of 2.120 meters (83.46 in.) for the period 1879–1922. The rainfall in the critical months, October and November, was 8 and 52 mm. against the normal 103 and 181 mm., respectively, for these months, and was by far the lowest recorded in the past 24 years. This is of interest, as Tengwall has shown that the correlation between the rainfall in October–November and the success of the cane crop in the following year is very close."

It is also noted that there "was a wider prevalence of the sereh disease, and an increase in root rot or physiological conditions similar to root rot; on the other hand the drought seemed to be unfavorable to the spread of the pineapple disease. Insect pests and white lice became more active, and also field mice and other small mammalian enemies of the sugar cane."

SOILS—FERTILIZERS

A study of soil heterogeneity in experiment plots, R. J. Garber, T. C. McIlvaine, and M. M. Hoover (*Jour. Agr. Research [U. S.], 33 (1926), No. 3, pp. 255–268, figs. 2*).—Studies conducted by the West Virginia Experiment Station of an experimental field containing 270 plats each with a gross area of approximately x acre to determine the degree of soil heterogeneity that existed are

reported. The yields of oats hay in 1923 and of wheat grain in 1924 were used as a basis for the study.

The 5-rod rows of wheat removed from certain places in each plat showed a high correlation between the weight of the grain and the weight of straw plus grain. A high correlation was also found between the weight of the grain plus straw on the entire net area of each plat and the weight of the grain produced by the rod row sample removed from each plat. A marked correlation was found between the yields of oats hay in contiguous plats, both when calculated in the usual way and when calculated by the formula suggested by Harris (E. S. R., 33, p. 727).

As in the case of the oats hay the wheat grain showed a marked correlation between the yields of contiguous plats and a slight correlation between the yields of replicated plats. In the case of oats hay and of wheat grain there was somewhat less difference between the coefficients of correlation for contiguous plats and replicated plats when calculated by the Harris formula than when calculated in the ordinary way. The correlation coefficients for the yields of replicated plats by the ordinary method of calculation were sensibly zero.

It is concluded that the particular experimental field under observation is not naturally uniform with respect to productivity. Plat replication is effective in equalizing yield differences due to soil heterogeneity. Some tendency was found for the plats which produced relatively high yields of oats hay in 1923 to produce relatively high yields of wheat grain in 1924.

Soil investigations (*Scot. Jour. Agr., 9 (1926), No. 1, pp. 20–33*).—Two contributions from the Edinburgh and East of Scotland College of Agriculture are presented on the subject.

I. *Soil investigations and their bearing on field experimental work*, W. G. Ogg.—Data are presented and analyzed which indicate the importance of limiting the number of variables so far as possible in laying down field experiments. It is considered advisable to concentrate at first on the most important and widespread soil types, and the experiments should, if possible, be continued on the same plats for several years.

II. *Soil sourness*, W. T. H. Williamson.—Data are presented and discussed on soil acidity and methods for its correction. Attention is drawn to the necessity for care in avoiding applying an excess of lime for certain crops, especially where the soil is deficient in organic matter. It is stated that the quantity required to cure sourness may be considerably less than that necessary to neutralize the acidity of the soil.

Soil survey of Fannin County, Georgia, S. W. PHILLIPS and J. W. STEPHENSON (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1923, pp. III+177–200, fig. 1, map 1*).—This survey, made in cooperation with the Georgia State College of Agriculture, deals with the soils of an area of 252,800 acres lying within the Appalachian Mountain physiographic province in the extreme northern part of Georgia. Much of the area is said to be very rough and mountainous, and is as a whole well drained.

The soils of the county are prevailingly light colored, ranging from grayish brown to reddish brown and red in the surface soils. They are predominantly silt loams and loams in texture and have a friable mellow structure. Including rough stony land, 14 soil types of 9 series are mapped, of which Talladega silt loam, Porters loam, and Porters stony loam cover 39.2, 19.3, and 14.4 per cent of the area, respectively.

Soil survey of Van Buren County, Michigan, R. WILDERMUTH ET AL. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1922, pp. III+829–870, figs. 2, map 1*).—This survey, made in cooperation with the Michigan Experiment Station, deals with the soils of an area of 389,760 acres in southwestern

Michigan. The topography is typical of a glaciated region and varies from level to hilly, the greater part being gently rolling. The natural drainage is said to be good in most parts of the county.

The soils are derived from glacial, alluvial, and lake bed materials. Including muck, 33 soil types of 16 series are mapped, of which Coloma loamy sand, Plainfield sand, and muck cover 12.9, 12.3, and 11.1 per cent of the area, respectively.

Soil survey of Cuming County, Nebraska, L. S. Paine et al. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1922, pp. III+787-827, fig. 1, map 1*).—This survey, made in cooperation with the University of Nebraska, deals with the soils of an area of 364,800 acres lying in the hilly region of eastern Nebraska. The topography is that of a level to steeply rolling upland modified by numerous narrow strips of flat alluvial lands and traversed by the broad shallow valleys of the Elkhorn River and Logan Creek. The area as a whole is said to be well drained.

Every soil type in the county with the exception of the recent sands shows the influence of grass vegetation. The most striking characteristic is the dark color of the surface soils. Including riverwash, 18 soil types of 10 series are mapped, of which the Marshall silt loam covers 69 per cent of the area.

The glacial sandstone and shale soils of Ohio, G. W. Conrey (*Ohio Sta. Bimo. Bul., 11 (1926), No. 4, pp. 144-154, figs. 10*).—The physical characteristics of these soils are described. The surface varies from the nearly level glacial plain to the rolling tracts along some of the main stream valleys. The soils have been derived largely from noncalcareous shales and sandstones, and are naturally low in lime and for the most part acid.

Moisture studies (*Nebraska Sta. Rpt. [1925], p. 31*).—It is reported that during the past 11 seasons 25.4 per cent of rainfall has been stored in the soil by summer tillage. The heaviest losses in moisture storage are by direct evaporation from the upper soil immediately following a rain and before this water has penetrated the soil sufficiently.

The pycnometer method for measuring the moisture content and porosity of soil [trans. title], P. I. Andrianov (*Nauch Agron. Zhur. (Jour. Landw. Wiss.), 2 (1925), No. 9, pp. 552-559, fig. 1*).—A new pycnometer for measuring the moisture content and porosity of soil and the method involved are described. The method is applied on the assumption of constant density of the soil and also without this assumption, and the probable error of a pycnometric determination of the moisture content of unfertilized podsol soil is estimated.

Utilization of summer rain by soil and plants [trans. title], N. M. Tulaĭkov and I͡U. V. Murashko (I. W. Muraschko) (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 2 (1925), No. 10, pp. 604-610, figs. 5*).—Studies conducted at the Saratov Experiment Station are reported which showed that the amount of summer rain which can be utilized varies from 60 to 80 per cent according to the condition of the soil surface. The utilization of the rain water taken up by the soil depends in large measure on the weather and the condition of plant growth.

The soil of early fallow was found to conserve nearly the total of the absorbed rain water. Winter rye, spring wheat, and sunflowers were found to utilize this water in 6, 8, and 12 days, respectively.

Relation between soil cultivation and the main factors of plant life [trans. title], A. G. Doĭarenko (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 2 (1925), No. 10, pp. 581-603, figs. 9*).—Studies conducted at the Moscow Agricultural Academy are reported which showed the influence of soil cultivation on the physical, mechanical, chemical, and biological properties of soil which influence the growth and maturity of crops.

Different kinds of plowing, for instance, were found to have distinct influences on soil moisture. Some types of plowing caused soil to dry out, while others increased the moisture content. Similar results were observed for different systems of fallowing. In some cases cultivation was found to produce a dry intermediate stratum of soil which was injurious to plant growth.

It was possible, by proper cultivation, to reduce moisture evaporation from soils as much as 79.5 per cent of that from fallowed soils. Cultivation was found to cause variations in the permeability of soil for water of from 5 to 42.5 per cent. Variations in soil air movement from 15 to 58 per cent were also produced. The coefficient of soil respiration was found to vary from 0.1 to 0.45 per cent under different methods of cultivation.

The most striking influence of cultivation was observed on soil nitrification. Large increases in nitrification occurred in well-cultivated soils, and it is suggested that cultivation may have some influence in making soil phosphoric acid available. Cultivation was also found to influence the physicochemical properties of the soil solution, its total concentration, and osmotic pressure.

Investigations in soil bacteriology (*Oregon Sta. Bien. Rpt. 1923–24, pp. 53–55*).—Field studies of the effect of lime on the biological activities of acid silty clay loam soil showed that this soil responded to the application of lime in the field as well as in the greenhouse. Larger quantities of nitrates were found in the limed plats, and laboratory tests showed that the nitrifying and nitrogen fixing powers of the soil were stimulated.

The application of sulfur alone to soils depressed the nitrate producing power, whereas the application of 100 lbs. of sulfur with 1 ton of lime stimulated the nitrate producing power of clay loam. Lime and sulfur together gave the largest yield of clover under greenhouse conditions, followed by an application of 100 lbs. of sulfur alone per acre. The oxidation of large quantities of sulfur materially lowered the yield of clover and also the nitrate producing power of the soil, whereas the acidity was greatly increased.

Adsorption of bacteria by soil [trans. title], E. V. Dianova (E. W. Dianowa) and A. A. Voroshilova (Woroschilowa) (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 2 (1925), No. 9, pp. 520–542*).—Studies conducted at the Agricultural Academy of Moscow are reported which showed that, when inoculated with a pure culture of bacteria, soil has the ability to adsorb later the bacteria in large numbers. The nature of this phenomenon is not fully understood, and it is described as adsorption only tentatively. This adsorption increased when the number of bacteria introduced increased. It also increased for a fixed number of added bacteria when the amount of soil used was increased up to a certain limit.

Different soil fractions showed a varying adsorptive capacity for bacteria. Coarse sand particles showed weak adsorptive powers, while highly disperse clay particles appeared to be the main adsorbing agents. Washed sand adsorbed practically no bacteria, while loam or chernozem soils showed high adsorptive powers.

The chemical activities of the bacteria were influenced by adsorption, being much weaker in the adsorbed than in the free state. They were retarded in a strongly adsorbing medium, such as soil or carbon, and the decomposition of organic matter was likewise retarded. On the other hand, the decomposition of organic matter in an inoculated nonadsorbing medium proceeded at normal speed.

The stronger the specific tendency to be adsorbed of a bacterial strain the greater was the difference between its chemical activities in soil and in sand, and vice versa.

A comparative study of the bacterial flora of wind-blown soil.—I, Arroyo bank soil, Tucson, Arizona, L. M. SNOW (*Soil Sci., 21 (1926), No. 2, pp. 143–165, figs. 4*).—In a contribution from Wellesley College a comparative study of the numbers and types of bacteria in arid wind-blown soil is reported. The soil under consideration was collected at depths of 6, 12, and 24 in. on the edge of Pantana wash at the side of the Tanque Verde Road, Tucson, Ariz.

The 12-in. layer had the greatest water content, both in actual amount and in relation to the water capacity. It was a little coarser and had larger contents of combustible material, soluble chlorides, carbonates, and sulfates than the other layers. It was also more nearly neutral in reaction. The 6-in. layer was the least favorable for bacterial growth. This was probably due to the fact that this layer was the driest and had the least combustible material, the highest hydroxyl-ion concentration, and the largest content of nitrates.

The numbers of bacteria per gram of fresh soil for the 6-in. depth were 401,000, for the 12-in. 1,898,500, and for the 24-in. depth 916,500. Of the total number of colonies for all depths 52.4 per cent were Actinomycetes, 0.77 per cent were filamentous fungi, and 46.81 per cent were yeasts and bacteria. The Actinomycetes were actually and proportionally more numerous at 24 in. than at 6 or 12 in.

Of the colonies which were not recognized as Actinomycetes, and were therefore classified as bacteria and yeasts, 88.33 per cent were white, 6.39 per cent yellow, 0.28 per cent orange, 1.11 per cent red, 1.39 per cent fluorescent, and 2.5 per cent brown. Morphologically 24.1 per cent were coccus or coccoid, 20.4 per cent were short, nonspore bearing rods, 13 per cent were long nonspore bearing rods, 42.6 per cent were long spore bearing rods, and 64.8 per cent were Gram negative. Culturally 35.3 per cent fermented glucose, 28.3 per cent fermented sucrose, 1 form fermented lactose, 70.4 per cent digested gelatin, 56.5 per cent digested casein, and 32.6 per cent reduced nitrates to nitrites.

Biochemical studies on the acidity of forest soils [trans. title], A. NĚMEC and A. KVAPIL (*[Czechoslovakia] Min. Zeměděl., Sborn. Výzkumn. Úst. Zeměděl. No. 2 (1923), pp. 60; also in Ztschr. Forst u. Jagdw., 56 (1924), No. 6, pp. 323–352; abs. in Internatl. Rev. Sci. and Pract. Agr. [Rome], n. ser., 3 (1925), No. 3, p. 738*).—Studies are reported which showed that the acidity of a dense evergreen forest soil was greater than that of a deciduous forest soil of the same region. The degree of acidity of the humus layers of soil under closely wooded conifers was always higher than that of the mineral layers underneath. The acidity of the layers of mineral soil in thickly wooded deciduous forests was found to be rather high and greater than that in the corresponding layers of humus.

In woods thinly covered with evergreen trees the humus layers of soil were less acid than the corresponding strata in thickly wooded forests of the same character in the same region. The humus soils in thinly covered deciduous forests were less acid than the corresponding soils in thickly wooded forests of similar species. The mineral subsoil of thinly wooded coniferous forests had about the same degree of acidity as that of thickly wooded forests of nondeciduous trees. The mineral subsoil of thinly covered forests of deciduous trees was less acid than that of densely covered forests of the same kind.

The humus soil of forests consisting of a mixture of deciduous and nondeciduous trees always showed a pH value lower than that of the corresponding strata of purely coniferous woods, and about the same as that of thinly covered coniferous forests or of dense forests of deciduous trees. The mineral subsoil of such mixed forests showed less acidity than the humus top soil. The degrees of acidity of the layers of soil were found to vary con-

tinuously during the year, the pH values being higher in the autumn than in the spring.

Hydrogen-ion concentration studies of Minnesota soils, E. A. Fieger (*Thesis, Univ. Minn., 1924, pp.* [3]+55, *figs. 5*).—Studies of the H-ion concentration of a large number of Minnesota soils representative of areas of mineral soils deficient in lime are reported. In this work a detailed comparison was made of the colorimetric and electrometric methods of determining the H-ion concentration, using soils from the early and late Wisconsin drifts, the sandy outwash plains, and the southeastern loess area. The colorimetric method was found unreliable.

Buffer action was found to rise and fall with the moisture equivalent. The H-ion concentration in all the soil profiles studied decreased regularly with increasing depth, indicating that leaching is the chief cause of the acid condition in mineral soils.

The growing of plants in pot cultures was found to decrease the H-ion concentration of the soil. The magnitude of this change depended upon the buffer value of the soil and the amount of growth made by the plants, as well as upon the original ion concentrations of the soil solution.

Applications of hydrated lime, marl, pulverized limestone, and limestone screenings at different rates a year or two previously were found to decrease the H-ion concentration of the surface soil. Hydrated lime and marl were the most efficient, followed in order by pulverized limestone and limestone screenings. The effect of the screenings was greater the finer their division. The larger the amount of any form of lime applied the greater was the change in the H-ion concentration, but the averages were not proportional to the amount applied.

The effect of some of the lightest applications on fine textured soils disappeared at the end of two years. On coarse textured soils the heavier applications caused decreases in the H-ion concentration of the second 6-in. section, while for the third 6-in. section only marl applied at the rate of 8 tons per acre caused a decrease. Only the largest applications produced any effect on the second 6-in. section of fine textured soil, and then only on those soils which showed the lower buffer values.

Combined fraction of the soil solution.—The negative adsorption of electrolytes by soil [trans. title], A. V. Trofimov (A. W. Trofimow) (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 2 (1925), No. 10, pp. 613–628, figs. 3*).—Studies conducted at the Moscow Agricultural Academy on the individuality of soil solutions and on the concentration and composition of the adsorbed parts thereof are reported, which involved a consideration of the phenomenon of so-called negative adsorption of electrolytes by black soils, loam, and podsol soils.

The electrolytes calcium nitrate and calcium chloride, and certain alkali chlorides, showed an irregular distribution in the soil solutions when added to the soils. The concentration of these electrolytes was less in the solution from the surface soil than in those from the other strata due to negative adsorption.

Negative adsorption was quite evident when the pressure method of obtaining soil solutions was used. The degree of nonuniformity of the soil solution could be quantitatively expressed in terms of salt-free strata. This degree of nonuniformity was directly proportional to the concentration of salts in the soil solution, and could be expressed by the so-called adsorption isotherm for all concentrations studied.

The volume of the adsorbing strata was found to lie between the limits of single and double hygroscopicity according to Mitscherlich. It was less stable

than the latter, and increased significantly after treatment of the soil with alkali solutions.

Studies on the growth of some Danish agricultural plants in soils with different concentration of hydrogen ions, C. OLSEN (*Compt. Rend. Lab. Carlsberg, 16 (1925), No. 2, pp. 22, figs. 6*).—Studies are reported which showed that five different cultivated plants varied considerably with reference to the effect of varying the H-ion concentration of the soil. Alfalfa and *Medicago lupulina* were found to thrive best in soils having pH values ranging from 6.5 to 7. Barley did best in a soil with a pH value of from 6.5 to 8, rye in a soil with a pH of from 6 to 6.5, and buckwheat in a soil with a pH of from 6 to 7. Rye and buckwheat could withstand higher H-ion concentrations in the soil than the other three plants.

The ability of the different plants to withstand higher alkaline reactions of the soil showed less variation, with the exception of the barley, the growth of which did not seem to decrease in the pH range of from 7 to 8. The growth of the other plants decreased with increasing pH values of from about pH 7 upward, so that the growth at pH 7.8 was only from 80 to 85 per cent of that at the optimum H-ion concentration. Even such decidedly calciphilous plants as alfalfa and *M. lupulina* were found to be sensitive to an increasing alkaline reaction of the soil. The results are taken to indicate that even in the cultivation of these calciphilous plants it is possible to give the soil too much lime.

The influence of available nitrogen on the fermentation of cellulose in the soil [trans. title], J. A. ANDERSSON (*Meddel. Centralanst. Försöksv. Jordbruksområdet [Sweden], No. 291 (1925), pp. 13, figs. 3; trans. in Soil Sci., 21 (1926), No. 2, pp. 115-126, figs. 3*).—In studies conducted at the Central Swedish Agricultural Experiment Station, the results showed that cellulose is decomposed in the soil at a rate which increases with the increase in available nitrogen until the latter is present in amounts necessary for the maximum growth of microorganisms. For the conditions of the experiments, this point was reached when the ratio of nitrogen to cellulose was about 1:35. When the nitrogen was present in amounts in excess of this ratio it seemed to have little influence on the course of the fermentation.

The amounts of cellulose fermented per milligram of nitrogen utilized were not constant, but decreased rapidly as the nitrogen increased. This is taken to indicate that the bacteria are most efficient when their nitrogen supply is limited. It was possible for nitrification to proceed in the presence of cellulose, but unless the nitrogen was present in quantities greater than that required by the bacteria the nitrates were utilized as rapidly as they were formed. It was possible for ammonia to serve as a source of nitrogen for cellulose-fermenting organisms without being first converted into nitrates. Since ammonia was present in soils containing cellulose when all of the nitrates had been utilized it appeared that the ammonification process continued in the presence of cellulose.

These results are taken to indicate that none of the soil processes are inhibited by the addition of carbohydrates to the soil. What occurs in the presence of the cellulose is that conditions in the soil are improved for the development of microorganisms, and these in turn utilize the available nitrogen for their growth, the nitrogen usually becoming a limiting factor. The growing plant appears to be quite unable to compete with the microorganisms, hence the crop failures on soils containing cellulose.

A further study showed that the nitrogen present in the natural residues returned to the soil either in the form of dead vegetation or manure is more available for cellulose fermentation than was previously supposed, and that

the accelerating influence of such compounds on this process is directly proportional to their rate of ammonification. Once the protein is hydrolyzed to the amino acid stage, its nitrogen seems to be practically as available as ammonia. The rate of cellulose decomposition is dependent, then, not only on the ammonia and nitrate nitrogen in the soil but also on the rate of decomposition of the more complex compounds containing nitrogen, such as peptone, casein, and manure.

Green manure rotations, C. F. Briscoe (*Mississippi Sta. Rpt. 1925, p. 31*).—The results of green manure rotation tests are reported to indicate a close relationship of bacterial counts and crop yields, and that legumes like lespedeza can not build up soil fertility as rapidly as soy beans, crimson clover, or cowpeas.

Crop yields from Illinois soil experiment fields in 1925, F. C. Bauer (*Illinois Sta. Bul. 280 (1926), pp. 158–174, fig. 1*).—This bulletin gives the 1925 crop yields for the major investigations conducted on these fields (E. S. R., 55, p. 320).

[Soil fertility studies at the Nebraska Station] (*Nebraska Sta. Rpt. [1925], pp. 14–16, 34, 35*).—It is reported that many eastern Nebraska soils are so depleted of organic matter and nitrifiable material that nitrate production is slow and may become a limiting factor for small grain. Nitrate production has been found to be comparatively slow at a temperature of 5° C. (41° F.) but increases with temperature, reaching its maximum at 35° and ceasing altogether at 55°. This is taken to indicate that the prevailing temperature between the time of late plowing for winter wheat seed bed preparation and May 15 may be too low to supply adequate nitrate for the crop. Nitrate production has been found to be insignificant at moisture contents as low as the hygroscopic coefficient of the soil, but increases with the moisture content up to a moisture content of 1.25 times the moisture equivalent.

Lime materials were found to have no appreciable effect on either the reception or retention of moisture by soils. Physical studies on two soils in the laboratory did not reveal that any liming material modified the fundamental tilth properties of cohesion, adhesion, or plasticity of the soil.

In a study of the proper rate of application of manure at the Scottsbluff Substation, 12 tons per acre was found to be more profitable for immediate yields than larger amounts. The residual effect of the manure was in direct proportion to the amount of manure applied. In a comparison of plowing and disking as a preparation for beets on potato soils, the beets on plowed soils yielded about 1.5 tons more per acre than those on disked soils. The stand of beets was almost directly proportional to the yield, the poorer stand being on the disked land.

Fertilizer and fertility tests, J. F. O'Kelly (*Mississippi Sta. Rpt. 1925, p. 11*).—It is reported that the lime test comparing different forms and quantities of lime for corn, cotton, oats, and cowpeas has continued to show no consistent gains for any form or quantity of lime. The average results of a four years' test of nitrogen sources for cotton showed that sodium nitrate and ammonium sulfate are about equal. Calcium cyanamide was not so efficient, and cottonseed meal was even less so. It is considered to be definitely determined that soils where cotton rusts need potash. Other tests of fertilizers are briefly described.

Soil and crop management for Tompkins County, New York, F. B. Howe (*N. Y. Agr. Col. (Cornell) Ext. Bul. 121 (1952), pp. 66, pl. 1, figs. 7*).—Practical information on the composition, fertility requirements, and crop adaptations of the soils of Tompkins County, N. Y., is presented, together with advice on the management of crops.

Soil fertility investigations (*Oregon Sta. Bien. Rpt. 1923–24, pp. 48–50*).—The results of 32 rotations started on 92 plats in 1915 are reported to indicate that where manure, clover, or lime has been followed with grain the yield of winter barley is about 60 bu. per acre, while the yield on plats continuously cropped to grain is about 25 bu. per acre. The value of rotation and fertility experiments has been found to increase with the duration of an experiment.

The results of fertilizer experiments with phosphorus, sulfur, and potash are also briefly summarized. Studies on the fineness of grinding of sulfur showed that the finest ground separates oxidized most rapidly. Crude sand sulfur oxidized more rapidly than the fine flour sulfur, although there was no evident reason for this difference. All of the sulfur separates were considerably oxidized after a month. It is apparently unnecessary to grind crude lump sulfur to extreme fineness for use on soils.

A chemical study of leachings from drainage tanks showed that applications of manure increased the loss of potassium, and the rather heavy loss of calcium continued. Appreciable losses of phosphorus have been noted and rather heavy sulfate losses, the latter being increased by manure applications. Nitrate losses have also been greater where manure was used. Both lime and manure have been found effective in increasing the permeability of soil both in white land and in silty clay loam.

Tillage and soil moisture studies showed that lime and manure have increased the average moisture content of the soil during the recent dry summers, and have decreased the water requirement per unit of dry matter.

Fertilizer tests (*Oregon Sta. Bien. Rpt. 1923–24, pp. 51, 52*).—Tests of a new nitrogen fertilizer called soda nitrogen and which consists largely of sodium nitrite are reported to have shown that very little oxidation of nitrite nitrogen occurred with several types of soil in small pots. It was also evident that large losses of nitrogen occurred in acid soil through the volatilization of decomposition products. The results of field tests substantiated the conclusions reached from the pot work.

Industrial wastes as manure, R. D. Rege (*Jour. Indian Inst. Sci., 8A (1925), No. 13, pp. 245–265*).—Part 1 of this report deals with the fertilizer value of ajowan and mohua cakes. The results with the ajowan cake indicated that this material does not diminish the activity of soil microorganisms, while its nitrogen content appears to be in an available form. The low availability of the nitrogen content of the mohua cake on the other hand was found to be due to the presence of saponin, which inhibits the formation of nitrates. Under these circumstances the use of the cake as a fertilizer is considered to be hardly practicable.

Data on the use of refuse as fertilizer, including street sweepings, household waste material, sewage, and sewage sludge are reported in part 2.

Arab manure [trans. title], F. Menchikowsky (*Zionist Organ. Inst. Agr. [etc.] Agr. Expt. Sta. Ext. Circ. 5 (1925), pp. 22, figs. 6*).—Studies of so-called Arab manure, which is material originating from human work, are reported.

Such accumulations can be of either recent or ancient date. Nitrogen, potash, and phosphorus are found in this material in compounds which are either soluble or insoluble in water, and in amounts many times greater than those occurring in chemical manures.

This material also contains a large amount of chlorides in the form of sodium chloride and sulfates in the form of sodium sulfate. The mechanical structure of the material is similar to that of clayey sand. Successive fertilization with this material for many years has been found to gradually change the structure of the soil.

The quantity of nitrates in Arab manure has been found to vary from 0.16 to 1.44 per cent in the form of potassium nitrate. It is concluded that the accumulation of potassium salts in this material depends on the content of decayed organic matter. It is also concluded that the soluble salts are gradually moving toward the top of the deposits.

Mauritian pen manure, F. HARDY (*Trop. Agr. [Trinidad], 1 (1924), No. 8, pp. 116–118*).—Studies of Mauritian pen manure are briefly reported.

The Mauritian practice consists in spreading machine-cut cane trash, herbage, or bush to a depth of 2 ft. on the floor of a covered pen. Cattle are turned into the pen daily for two weeks. At the end of this period the urine-soaked litter is transferred to a water-tight pit. It must not be stacked too loosely in the pit on account of the danger of excessive decomposition. When the contents of the pit have broken down properly the manure is either applied to the soil or suitably stored.

The results of analyses of this material indicate that it may differ but little from, or may be even superior, to pen manure prepared in the usual manner. The most serious disadvantages of the method are the high initial cost of the trash cutter, pen, and pit, and the expense of handling the manure during its preparation.

Potash in 1924, G. R. MANSFIELD and L. BOARDMAN (*U. S. Dept. Com., Bur. Mines, Min. Resources U. S., 1924, pt. 2, pp. IV+27–61*).—Data are presented on the production and sale of potash in this and in foreign countries during 1924 and on the development of new sources of potash. The predominance of Germany and Alsace as producers of potash is emphasized.

Phosphate rock in 1924, G. R. MANSFIELD (*U. S. Dept. Com., Bur. Mines, Min. Resources U. S., 1924, pt. 2, pp. II+77–112*).—Data are presented on the production and sale of phosphate rock during 1924. It is stated that the sales of phosphate rock in the United States decreased 5 per cent in amount from the previous year and 11 per cent in value.

Action of calcium carbonate and phosphorite on the composition of soil solutions and water extracts from soils [trans. title], D. DRUZHININ (DRUJININ) (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 2 (1925), No. 10, pp. 629–644*).—Studies conducted at the Moscow Agricultural Academy of solutions and water extracts taken during the cropping period from a series of podsol soils treated with calcium carbonate and phosphorite are reported.

The results showed that the quantity of calcium equivalent varied from 64 to 95 per cent of the sum of all the anions in the solution. The quantity of adsorbed calcium reached an average of about 80 per cent of the total quantity of adsorbed cations.

The accumulation of nitrates in unfertilized soils was ordinarily not accompanied by a decrease of the ratio of calcium equivalent to the sum of the acid equivalents. In limed soils the calcium equivalent and the sum of the anions were approximately the same. In soils treated with phosphorite nearly all the anions were also saturated with calcium.

Adsorbed calcium was found to be the most important agency in the neutralization of nitric acid produced in unfertilized soils. In limed soils the calcium of the bicarbonates becomes active in this respect, and in soils receiving phosphorite the calcium of the phosphorite is active.

The use of acid salt with tricalcium phosphate [trans. title], M. FOUASSIER and J. LHOMME (*Compt. Rend. Acad. Agr. France, 11 (1925), No. 35, pp. 934–937*).—Plat experiments are reported which showed that the use of a mixture of phosphate and bisulfate increased the availability of the phosphate.

Transformation of sulfur into sulfate by means of microbian association [trans. title], G. GUITTONNEAU (*Compt. Rend. Acad. Sci.* [*Paris*], *181* (*1925*), *No. 6, pp. 261, 262*).—Studies are briefly reported which indicated that be an association in a suitable medium of soil organisms capable of transforming sulfur into hyposulfite with organisms capable of transforming hyposulfite into sulfate, an almost direct formation of sulfate from sulfur may result. The presence of ammonium succinate, while favoring the accumulation of hyposulfite, was frequently found to hinder the production of sulfate.

AGRICULTURAL BOTANY

[Carnegie Institution of Washington] laboratory for plant physiology, D. T. MACDOUGAL ET AL. (*Carnegie Inst. Wash. Yearbook 24* (*1924–25*), *pp. 137–169, fig. 1*).—This report includes an account of results obtained during the year in studies on such matters as photosynthesis, respiration, growth, hydration reaction of cell masses and of colloids, permeability, and sap pressures and movements. Attempts are made to correlate physiological measurements with the inevitable relation of the plant to its environment. The very low precipitation gave exceptional opportunity for study of the behavior of desert vegetation in such crises. Some of the phases of this work are presented in the reports noted below.

Dendrographic studies of growth in trees, D. T. MacDougal.—The systematized information made available by a number of continuous dendrographic records makes it possible to evaluate and correlate various agencies in growth, also the effects of topping, girdling, pruning, defoliation, and other limiting practices, and the reactions to beetle work. The attempt was made to interpret variations in volume in terms of sap tension and movement.

Reversible variations in volume of stems and movement of sap, D. T. MacDougal.—The facts here detailed suggest that a closer analysis of facts of reversible variations, changing pressures, and transpiration as modified by stomatal action will be necessary for a full interpretation of the mechanism of the ascent of sap.

Hydrophilic effect of ions on agar and protoplasmic components, D. T. MacDougal and B. L. Clarke.—Experimentation testing the view that swelling or hydration of agar in water is lessened by substances dissolved in the agar was carried out with the special auxograph. It is stated that plates of common agar, when air-dry and containing about 25 per cent of water, with from 2.5 to 3 per cent of ash, show at from 16 to 18° C. an increase in volume in excess of that in water in chlorides and hydroxides of sodium, potassium, calcium, and magnesium at concentrations ranging between 0.001 M and 0.0001 M in different cases.

Physicochemical basis of colloidal swelling, B. L. Clarke.—The question as to what variables determine the extent of inhibition of a liquid by a gel and what is the form of the function is discussed.

Abnormal absorption of potassium over sodium by the "constructed cell," B. L. Clarke.—The rate of absorption of the ions rather than the final amounts appears likely to prove to be the significant factor.

The effect of narcotics on living cells, V. Úlehla.—"The main action of narcotics presents itself as a modification of the distribution in the free water-content of the cell. Through such changes in water distribution it is evident that other secondary changes in permeability, respiration, photosynthetic and enzyme activity, etc., must be introduced also. But the primary effect is one of rearrangement of free water-content in the cell structures, upon which a hydration theory of narcosis is proposed."

Absorption and exudation pressures of sap in plants, D. T. MacDougal.—Absorption and exudation pressures in Carnegiea were studied by means of bore holes into which osmotically potent solutions were introduced, with results which are detailed.

Methods of measuring movement and pressure, and of extraction of sap in trees, D. T. MacDougal.—Several methods and their results are briefly discussed.

Effect of disturbances in the hydrostatic system of a tree by girdling, topping, and defoliation, D. T. MacDougal.—The effects of these operations are described for the Monterey pine.

Water intake in plant cells with special regard to desert succulents, V. Úlehla.—The author finds that in Opuntia and Carnegiea the suction force of partially desiccated cells increases to a maximum and then decreases, following a curve which slopes in the beginning slowly and becomes very steep at both sides of the maximum. The curve is very similar to that of the swelling action in agar-agar gels with different initial water content discovered by Clarke (E. S. R., 54, p. 320). The suction force expresses not an equilibrium but a rate. The equilibrium attained in different concentrations varies considerably with the time of previous immersion in water. The water intake of water vapor is entirely different from that of liquid water in Carnegiea.

Water factors in plant cells (especially in desert succulents), V. Úlehla.—Consideration of the features briefly discussed brings into view a complex picture of the cell, especially of desert succulents, which is widely different from that embodied in the prevalent conception of the cell as simply an osmotic engine.

The oxidation of glucose with air, H. A. Spoehr and J. H. C. Smith.—A system has been devised, consisting of a complex iron-phosphate catalyst and sodium phosphate, by means of which various monosaccharides, disaccharides, and polyatomic alcohols are oxidized to carbon dioxide by atmospheric oxygen. These organic substances are not autoxidizable. It is the iron which reacts with molecular oxygen and in turn under certain conditions with the organic substance. This system has served as a "model" of respiratory oxidation by means of which the conditions characteristic of this type of oxidation can be studied. The scope and results of such a study are outlined.

The kinetics of the oxidation by sodium ferropyrophosphate, J. H. C. Smith.—From the oxidation of sodium sulfite and potassium arsenite the conclusion was reached that the oxidation was carried on by two processes indicated. Details are given.

The oxidation of sodium formate with atmospheric oxygen, W. G. Young and J. H. C. Smith.—Oxidation was very much more rapid in the presence of pyrophosphate than with ferrous sulfate or ferrous phosphate.

Effect of disodium phosphate on hexose sugars, H. A. Spoehr and P. C. Wilbur.—A series of investigations was carried out to determine the effect of phosphates on *d*-glucose and *d*-fructose. There is some evidence for believing that glucose is converted into fructose or into some active form of glucose before it is fermented or oxidized. The experimentation and its results are briefly indicated.

Absorption of carbon dioxide by leaf material, H. A. Spoehr and W. Newton.—Studies were carried out to determine the nature of the substance in the leaf which absorbs carbon dioxide, and to show whether or not this is a property common to all organs capable of photosynthesis. The theory that carbon dioxide absorption is due to proteins was not supported by the experimental facts obtained. A wide variety of plant material, killed and dried in the same

manner as the sunflower, was tried, but none of this showed an unmistakable capacity of carbon dioxide absorption.

Bacteria of arroyo soil, Tucson, Arizona; A summary of results, L. M. Snow.—In this study only those bacteria are considered which grow aerobically on ordinary culture media. The soil used was collected at 6, 12, and 24 in., near Tucson, Ariz., where the rainfall was 13.27 in. The 12-in. layer had the greatest water content. The 6-in. layer was least favorable for bacteria.

Influence of moisture on soil temperature, F. Shreve.—Data are given as taken in 1924 and in 1925. High soil temperature plays an important rôle among the conditions which make the arid foresummer a critical period for plants, and the cooling of the soil by the midsummer rains, or by irrigation, is an important factor in stimulating activity under those conditions.

Deserts of northeastern Lower California, F. Shreve.—In November, 1924, an expedition was made from Calexico, Calif., along the western edge of the delta of the Colorado River into the deserts of extreme northeastern Lower California. This is here described.

An unusually arid season in southern Arizona, F. Shreve.—"By the end of May, 1925, the perennial vegetation in the vicinity of the Desert Laboratory had reached a condition of desiccation such as has not been seen since the establishment of the laboratory in 1903." The effects of this condition are detailed.

Expeditions to the deserts of northeastern Lower California, the California coast, and the Gulf of California are also described by F. Shreve.

Age and area from the viewpoint of phytogeography, H. A. Gleason (*Amer. Jour. Bot., 11 (1924), No. 9, pp. 541–546*).—A further critical review (E. S. R., 51, p. 821) is given of the age and area hypothesis as set forth by Willis.

Does light determine the date of heading out in winter wheat and winter rye? J. Adams (*Amer. Jour. Bot., 11 (1924), No. 8, pp. 535–539*).—Both winter wheat and winter rye require a longer growing season than spring varieties of the same species. The growing season is not sufficiently long in the latitude of Ottawa for the heading out of these varieties if sown in the open in spring. In this respect their behavior resembles that of winter annuals or biennials. "Both light and heat determine the time of heading out of the two species here discussed, both these climatic factors being of equal importance and, to a certain extent, interchangeable."

The effect on tomato, soy bean, and other plants of altering the daily period of light, J. Adams (*Amer. Jour. Bot., 11 (1924), No. 4, pp. 229–232*).—In 1922, in pursuance of the work previously noted (E. S. R., 52, p. 327), further experiments were carried on at Ottawa, Canada, with tomato, soy bean, hemp nettle (*Galeopsis tetrahit*), and shamrock (*Trifolium dubium*). The average period of daylight, naturally about 15 hours, was reduced to about 12 hours between May 2 and June 12, but the period of darkening was not the same for all plants.

Tomato plants were affected but little, if at all. Soy bean plants flowered earlier in correspondence with the shortened daylight period. Hemp nettle plants flowered later for darkening, but grew taller. Shamrock was delayed about 11 days by being darkened as above noted.

The effect of fluctuations in the CO_2 content of the atmosphere on the rate of respiration of leaves, H. A. Spoehr and J. M. McGee (*Amer. Jour. Bot., 11 (1924), No. 8, pp. 493–501, figs. 8*).—The experimental material used in this work consisted of single excised leaves of *Helianthus annuus*, *Echinocystis fabacea*, and *Hydrangea hortensis*, cut as indicated in a previous notation

(E. S. R., 49, p. 728), with apparatus appropriately altered. The method of carbon dioxide determination was that already described (E. S. R., 51, p. 111).

These experiments show that, due to phenomena indicated, carbon dioxide emission rate must be employed with caution as a measure of photosynthesis.

A physiological and anatomical study of the leaves of Polypodium polypodioides, L. J. PESSIN (*Amer. Jour. Bot., 11 (1924), No. 6, pp. 370–381, pl. 1, figs. 2*).—Leaves of *P. polypodioides* under dry conditions lose water so as to curl in the upper epidermis, leaving the lower exposed. Such curling of the living leaf apparently results from osmotic action. Expansion occurs, in dead leaves, as the result solely of imbibition; in living leaves, of both imbibition and osmosis. The leaf scales presumably promote the gradual and equal distribution of water over the leaf surface after a rain, absorption by the leaf of surface water, and transference of water to the internal tissues of the leaf.

Total acidity compared with actual acidity of plant juices, F. G. GUSTAFSON (*Amer. Jour. Bot., 11 (1924), No. 6, pp. 365–369, figs. 6*).—"As illustrated by *Zea mays, Cucurbita maxima, Helianthus* sp., and *Bryophyllum calycinum*, the total acid of the plant juice is not responsible for the H-ion concentration gradient found in plants. There is no constant relation between total and actual acidity in these plants. The juice from young parts of plants requires more sodium hydroxide to neutralize it than does juice from older parts of the same plant, even when the former is nearer to the neutral point at the beginning than the latter."

The transformations and course of development of germinating maize, E. H. TOOLE (*Amer. Jour. Bot., 11 (1924), No. 5, pp. 325–350, figs. 4*).—An attempt has been made to follow some of the histological and chemical changes that take place as germination progresses in maize seeds under an arbitrarily chosen standard set of environmental conditions. Evidence appears regarding correlation of the activity of the epithelial layer with growth changes in other parts of the seed. Complete agreement is recorded as existing between the evidence from microchemical and that from quantitative methods. The course of development as outlined may, it is thought, be modified by variations in the external environment.

Anatomy of the vegetative organs of the sugar beet, E. ARTSCHWAGER (*Jour. Agr. Research [U. S.], 33 (1926), No. 2, pp. 143–176, figs. 23*).—A detailed account is given of the gross morphology and anatomy of the various organs of the sugar beet.

The pneumathodes on the roots of the oil palm (Elaeis guineensis Jacq.), C. YAMPOLSKY (*Amer. Jour. Bot., 11 (1924), No. 8, pp. 502–512, pls. 2*).—Pneumathodes, root surface organs permitting direct gas exchange through air chambers in roots of the oil palm, originate like secondary roots but become modified secondarily. Pneumathodes show a characteristic modified aerenchyma tissue. These organs may be induced to develop in large numbers on underground roots by excessive moisture. These formations are not to be classed as intumescences.

Some relations of Fusarium lini and potassium cyanide, E. S. REYNOLDS (*Amer. Jour. Bot., 11 (1924), No. 4, pp. 215–217*).—The immediate objectives in this work were to test the toxic effects of potassium cyanide upon *F. lini*, also to determine any possible growth stimulation due to its presence. It is thought probable that certain results shown were due to a growth-stimulating influence of potassium cyanide. Apparently the fungus, at first injured by the poison, becomes habituated to it, and is even benefited by its presence, at least as regards vegetative growth.

Relation of temperature to the growth of thermophilic bacteria, F. W. Tanner and G. I. Wallace (*Jour. Bact., 10 (1925), No. 5, pp. 421–437, figs. 5*).—Growth curves are shown, with discussion, for three selected cultures of thermophilic bacteria at 20, 37, and 55° C. in plain broth.

Hydrogen sulphide production by anaerobic spore-bearing bacteria, M. C. Kahn (*Jour. Bact., 10 (1925), No. 5, pp. 439–447*).—In tests with 16 species (36 strains) of anaerobic spore-bearing bacteria, the culture medium of F. W. Tilley,[1] containing sodium thiosulfate and lead acetate and modified for this purpose, was found to be satisfactory for testing the capability of this group for elaborating hydrogen sulfide.

No essential correlation was found between native protein digesting ability and the hydrogen sulfide producing properties of these organisms. "It is suggested that Tilley's medium be employed in testing the so-called blackening ability of the anaerobic spore bearers instead of the less delicate and indefinite meat mash and brain preparations."

Concerning the physiology of Thiobacillus thiooxidans, an autotrophic bacterium oxidizing sulfur under acid conditions, R. L. Starkey (*Jour. Bact., 10 (1925), No. 2, pp. 135–163, fig. 1*).—Oxidation is most rapid in the early stages of the process, following a short lag period of about two days, and decreases with the age of the culture. The decreased oxidation rate is due apparently not to any attenuation of the organism nor to the accumulation of any toxic organic metabolic products, but rather to the accumulation of sulfuric acid. Details are given regarding growth, oxidation, the sulfur-carbon ratio, and salts. The organism does not deteriorate or become attenuated during long incubation periods in synthetic inorganic solution media. Growth ceases in the absence of either carbon dioxide or oxygen. Slightly reduced pressure is ineffective on oxidation, but slightly increased pressure enhances that process. Temperatures above 50° C. are quickly fatal to the organism. Maximum oxidation occurred between 27 and 30°. Oxidation is greatly retarded at lower temperatures. The organism is not resistant to desiccation.

Concerning the carbon and nitrogen nutrition of Thiobacillus thiooxidans, an autotrophic bacterium oxidizing sulfur under acid conditions, R. L. Starkey (*Jour. Bact., 10 (1925), No. 2, pp. 165–195, figs. 3*).—Summarizing the results of experiments concerned with glucose in sulfur media used for the cultivation of an autotrophic sulfur-oxidizing bacterium, *T. thiooxidans*, the author outlines the main findings, particularly as regards glucose, citric acid, nitrate and ammonium nitrogen, urea, and oxidation.

GENETICS

Gregor Johann Mendel: Life, work, and accomplishments, H. Iltis (*Gregor Johann Mendel: Leben, Werk, und Wirkung. Berlin: Julius Springer, 1924, pp. VIII+426, pls. 12, figs. 59*).—The first part of this book describes the life, interests, and surroundings of Mendel. The second part deals briefly with the principles of Mendelism.

A comparison of mitosis in chick tissue cultures and in sectioned embryos, R. T. Hance (*Biol. Bul. Mar. Biol. Lab., Woods Hole, 50 (1926), No. 2, pp. 155–159, figs. 5*).—Mitosis in chick-tissue cultures prepared by Mrs. M. R. Lewis has been compared with mitosis as observed in sectioned embryos. It is pointed out that the tissue cultures grow over the cover glass one cell thick with division always taking place parallel to the cover glass; therefore, polar views of the chromosomes can not be obtained. No differences in the chromo-

[1] Jour. Bact., 8 (1923), No. 2, pp. 115–120.

some numbers have been observed. The shape of the larger chromosomes was found to be comparable, but the size of the chromosomes in the tissue culture cells was larger.

On the meiotic division of pollen-mother-cells of Polygonum savatieri, Nakai, T. SUGIURA (*Bot. Mag.* [*Tokyo*], *39* (*1925*), *No. 467, pp. 291–296, pl. 1*).—This article describes and illustrates the course of meiotic division of the pollen mother cells of *P. savatieri*.

Chromosome number and individuality in the genus Crepis, I, II (*Calif. Univ. Pubs. Agr. Sci.*, *2* (*1925*), *No. 10, pp. 297–314, pl. 1; 2* (*1926*), *No. 11, pp. 315–341, figs. 7*).—These papers are contributions from the division of genetics, University of California. The first, by M. C. Mann, is a comparative study of the chromosome number and dimensions of 19 species. The second, by E. B. Babcock and M. M. Lesley, deals with the chromosomes and taxonomic relationships.

***Sequence of corresponding third-chromosome genes in Drosophila* melanogaster and D. simulans,** A. H. STURTEVANT and C. R. PLUNKETT (*Biol. Bul. Mar. Biol. Lab., Woods Hole, 50* (*1926*), *No. 1, pp. 56–60, fig. 1*).—The authors reported experiments in which *D. melanogaster* and *D. simulans* were crossed for the identification of the relation of similar genes in the two species. The three genes, sepia, hairless, and claret, were shown to have a different relation in a third chromosome in the two species but were nevertheless identical. It is concluded that there has been an inversion of a section of this chromosome in one species, and that identity of sequence is not a necessary condition for a correspondence of genes in different species. The hybrids produced by this cross were sterile and consequently could not be carried further than the first generation.

Reddish—a frequently "mutating" character in Drosophila virilis, M. DEMEREC (*Natl. Acad. Sci. Proc., 12* (*1926*), *No. 1, pp. 11–16*).—The appearance of reddish bodied flies has been observed in studies of inheritance in *D. virilis* at the Carnegie Institution of Washington, Cold Spring Harbor. As this character somewhat resembled yellow and was sex linked, crosses were made with yellow flies. The F_1 females were yellow, from which it was assumed that reddish and yellow were allelomorphs, but in the F_2 generation there were 112 reddish, 129 yellow, and 30 wild type flies. Further studies of the unexpected production of the wild type flies, as well as efforts to find the locus of the reddish gene, indicated that reddish is allelomorphic to yellow but that it frequently mutates to the wild type.

On the genetics of the spotted domestic pigeon [trans. title], C. WRIEDT and W. CHRISTIE (*Ztschr. Induktive Abstam. u. Vererbungslehre, 38* (*1925*), *No. 4, pp. 271–306*).—In continuing the studies of the inheritance of characters in pigeons (E. S. R., 51, p. 334), the influence of five genes related to spotting is described. The results are based on the characteristics of 434 offspring produced in 66 matings of black spotted white, black spotted brown, and gray spotted reddish brown Danish Tumblers, with nonspotted birds of the same variety.

The behavior of five factors influencing spotting was determined as follows: *St*, a dominant factor for spotting which was described in the preceding paper; *B*, a dominant factor for brown color; *bm*, a recessive factor acting on *Bb* individuals to dilute the color of the tail and posterior part of the back; *We*, a possible sex-linked factor for white ground color acting only in the presence of *St*; and *H*, a dominant factor for leg feathering. A study of the linkage from 48 offspring between *St* and *d*, a dilute factor, both of which were sex linked, gave crossover percentages of 54.2 per cent, but an explanation of such a large amount of crossing-over must await further experimentation. Eye abnormalities were observed in considerable numbers among reddish-brown

birds with gray spots, but no analysis was made, largely because these birds died before reaching breeding age.

Maize and man, J. H. Kempton (*Jour. Heredity, 17 (1926), No. 2, pp. 32–51, figs. 19*).—This is an illustrated discussion of archaeological and botanical evidence of the origin of corn, touching on the development of the crop by man and on the possible bearing of genetic studies in corn on eugenic problems.

A dominant brown pericarp color in maize, E. G. Anderson (*Mich. Acad. Sci., Arts, and Letters, Papers, 5 (1925), pp. 73–75*).—A brown pericarp color derived from brown pericarp corn from Ecuador appears to be dominant to the ordinary red color and is probably due to a single factor difference. This factor is independent of the *P* series of allelomorphs for pericarp color or at least not closely linked. Brown pericarp appeared on dilute sun-red, sun-red, dilute purple, and purple plants in contrast to the recessive brown described by Emerson (E. S. R., 45, p. 533). Tests on a brown variegated strain also of South American origin gave results paralleling those reported above.

The inheritance of nitrogen content in pure lines of barley [trans. title], B. Dutkiewiczówna (*Pam. Państ. Inst. Nauk. Gosp. Wiejsk. Pulawach (Mém. Inst. Natl. Polon. Écon. Rurale Pulawy), 5 (1924), A, pp. 332–355*).—Investigations during three years with several pure lines of *Hordeum distichon nutans* and *H. vulgare pallidum* seemed to show that the content of nitrogenous compounds expressed in percentage of the dry matter of the grain is a heritable character for the pure lines of barley. Under conditions approaching the optimum, the plant takes up an amount of nitrogen proper to its species. Variations from the optimum reduced grain production, generally inhibited plant growth, and increased the contents of nitrogenous compounds. The optimum for the species depends on growth factors, especially soil fertility and soil moisture.

The size of stem, intimately connected with its length, was correlated closely with the general configuration of the stem and also with the leaf surface. No correlation seemed to exist between weight per 1,000 kernels and the nitrogen content. Nitrogenous fertilizers increased the nitrogen content; with the same treatment the awns elongated and the coefficient of transpiration rose. The most economical usage of water took place under conditions optimum for the species.

Intergeneric hybrids in Aegilops, Triticum, and Secale, C. E. Leighty, W. J. Sando, and J. W. Taylor (*Jour. Agr. Research [U. S.], 33 (1926), No. 2, pp. 101–141, figs. 18*).—An extensive series of hybridizations of *A. ovata* and *A. triuncialis* with *T. monococcum, T. dicoccum, T. dicoccoides, T. durum, T. polonicum, T. turgidum, T. compactum, T. spelta,* and *T. vulgare,* and also with *S. cereale* is reported on from studies at Arlington, Va. *A. ventricosa* also was used in a few cases.

Of the flowers of *A. ovata* and of *A. triuncialis* pollinated by Triticum 44.6 and 45.5 per cent, respectively, produced seed. Reciprocal crosses resulted in 3.1 per cent of fertility with *A. ovata* pollen on Triticum species, and 10.4 per cent with *A. triuncialis* pollen. Using *S. cereale* pollen on *A. ovata* and *A. triuncialis* flowers resulted in 28.3 and 50 per cent, respectively, of fertility. Seeds obtained in Aegilops-Secale crosses were poorly developed and germinated very poorly, and the plants obtained were entirely sterile. F_1 plants were matured from crosses between *A. ovata* and one or more varieties of each species (or subspecies) of Triticum named, and also *S. cereale.* This also held true for *A. triuncialis,* except in the cross with *T. monococcum.* Although the F_1 plants generally resembled the Triticum parent, Aegilops characters predominated. Self-fertility existed in the F_1 of Aegilops-Triticum hybrids, although self-sterility is by far the most common condition.

Among the numerous back crosses made on the F_1 plants 2.4 per cent of the *A. ovata*-Triticum flowers pollinated by Triticum species produced seed, and 2.7 per cent of the *A. triuncialis*-Triticum flowers. Two seeds were produced in 214 F_1 *A. ovata*-Triticum flowers pollinated by *A. ovata* pollen. *A. ovata* and *A. triuncialis* pollen did not produce seed when used on F_1 *A. triuncialis*-Triticum flowers. Hybrids in which *T. durum* was one parent were the most generally fertile on back crossing and were at least equally self-fertile in comparison with other hybrid combinations. Plants obtained by back crossing the F_1 of the Aegilops-Triticum hybrids with pollen of wheat, often termed "*A. speltaeformis*," were partially self-fertile.

The explanation of hybrid vigor, W. E. Castle (*Natl. Acad. Sci. Proc., 12 (1926), No. 1, pp. 16–19*).—This is a discussion of hybrid vigor based mainly on the results of experiments conducted by Gates (E. S. R., 55, p. 427) and C. C. Little and E. E. Tyzzer,[2] in which the Japanese mouse was crossed with the house mouse. The latter publication described a more rapid growth in the hybrids of a tumor originating in the Japanese mice than in the pure strain. Susceptibility to the tumor was rare in the F_2s and unknown in the house mouse. It is suggested that a large number of factors are necessary for tumor susceptibility, and that the recombination of all occurs only rarely in the F_2s. The case of hybrid vigor is considered as comparable, and thus gives evidence of additional metabolic energy accompanying the heterozygous condition in explaining hybrid vigor as opposed to the idea of specific factors for vigor being added to the zygote in the crosses.

Polynuclear ova and polyovular follicles in the opossum and other mammals, with special reference to the problem of fecundity, C. G. Hartman (*Amer. Jour. Anat., 37 (1926), No. 1, pp. 1–51, figs. 36*).—In a study of preparations of opossum ovaries from approximately 150 animals at the University of Texas and the Carnegie Laboratory of Embryology, polynuclear ova were found in all but 12 and polyovular follicles in approximately two-thirds of the animals. The opossum appears to be unique in the prevalence of the multiple structures and in the astounding numbers and diversity of forms in which they occur. Over 100 ova were observed in the same follicle in certain cases. The polynuclear ova and the polyovular follicles were mostly primordeal, but the multiple nuclei were also present in growing follicles with stratified granulosa. The most advanced stages of the multiple structures observed were always atresic, and no compound follicles were found among the ripe follicles. The various types of polyovular follicles found are described, and an attmept is made to classify them. The multiple structures were more common in the ovaries of fetuses and young females than in older females of the opossum as well as of other animals.

The evidence indicates that polynuclear ova arise by the fusion of separate ova, but that polyovular follicles do not come from polynuclear ova or from the fusion of follicles but are persistent remains of Pfluger's tubes that have failed to separate. Various reasons are given for the inability of polynuclear ova to be related to twinning, and they are not a direct cause of increased fertility but are closely correlated with it since they are expressions of the same growth stimuli.

Structural characteristics of double-yolked eggs and the relation of the membranes of twin embryos resulting from a double-yolked egg, M. D. Sumulong (*Philippine Jour Sci., 28 (1925), No. 4, pp. 549–557, pl. 1, figs. 2*).—The relations of yolks and membranes in 3 double-yolked eggs are described. In 1 egg the 2 yolks possessed distinct and independent chalazal and vitelline

[2] Jour. Med. Research, 33 (1916), No. 3, pp. 393–453.

membranes. In the other 2 eggs, the egg envelopes were common to both yolks. The embryos at 18 days of incubation in a double-yolked duck egg are also described. Both embryos were normal, although one weighed 20 gm. and the other 15 gm. without the yolk sac. They were surrounded by a common chorion and a common allantoic cavity, but each possessed an independent allantoic stalk. Anastomosis of the blood vessels in the outer wall in the allantois also indicated that independent membranes were first produced and later fused.

The effect of vasectomy on swine, B. L. WARWICK (*Anat. Rec., 31 (1925), No. 1, pp. 19–21*).—*Three boars varying in age from 115 days to 1.5 years* were vasectomized on both sides for a study of the effect of this operation on the histology of the testicles. Mutilation of some of the tissues in 1 boar led to a pronounced atrophy of the testicles, but the testicles of all 3 animals showed normal histological pictures. The testicles of the 2 in which no atrophy occurred were somewhat distended with semen, and a microscopic examination showed the presence of many normal spermatozoa. These findings support the conclusions of R. Oslund that vasectomy does not cause degeneration of the seminiferous tubules in animals with closed inguinal canals. This experiment was carried on at the University of Wisconsin.

Studies on the sex-ratio and related phenomena.—VI, The effect of polygyny, A. S. PARKES (*Ann. Appl. Biol., 12 (1925), No. 2, pp. 211–217*).—In continuing this series (E. S. R., 52, p. 630), the effects of polygyny on the sex ratios of man and horses are discussed from the reports in the literature, and, data are given on 7 matings of single males with 8 to 12 females in mice. Among the 395 offspring produced from these matings there were 59.2±1.67 per cent of males, as contrasted with 53.2±0.81 per cent of males among 1,701 mice produced in monogynous mating. The difference being more than three times the probable error, it is considered significant. The percentage of males was still higher among the offspring of the last females fertilized in two of the matings on which the records of the sequence of births were available. In explanation of these results it is suggested that the excessive sexual activity of the male reacts more strongly on the female-producing spermatozoa, which have been shown to have larger heads, and this makes fertilization by the male-producing spermatozoa more likely.

Studies on the sex-ratio and related phenomena.—VII, The foetal sex-ratio in the pig, A. S. PARKES (*Jour. Agr. Sci. [England], 15 (1925), No. 3, pp. 284–299, fig. 1*).—This paper deals with the sex ratios of fetuses obtained in the uteri of pregnant sows killed at the Islington abattoir. These fetuses ranged in weight from 5 to 1,800 gm. Among 281 which weighed from 0 to 100 gm., 59.1±1.98 per cent were males; among 114 averaging from 101 to 300 gm., 57.0±3.12 per cent; and among 188 weighing over 301 gm., 53.2±2.45 per cent were males. In the total population, 56.8±1.38 per cent were males.

The author concludes that the fetal ratio of males is much above the postnatal ratio, and therefore that during gestation the proportion of males decreases. It is estimated that the conception ratio is approximately 150 males per 100 females. The sex ratios of the fetuses in the two cornua were compared and found not to be significantly different.

The average weights of the males in litters were compared with the average weight of the fetuses in the total litter, and it was found that the males were heavier in 34 out of 51 cases and lighter in 13 cases. The males averaged approximately 7 per cent heavier than females. In comparing the two cornua of the uterus, there was an average of 6.1 fetuses in the right cornu and 5.6 in the left cornu, but no significant difference was found in the average

weights. In 10 out of 15 cases the heavier fetuses were found in the cornua containing the smaller numbers. The alleged greater size of the right ovaries may account for the slightly greater fertility in the corresponding cornu.

Several hypotheses for explaining the cause of the excess males at conception are discussed, and it is concluded that the most logical is based on a difference in the ability of the X- and Y-bearing sperms to reach the ova. The greater male prenatal and postnatal mortality is explained as due to a relatively lower viability of males.

The determination of sex in animals, W. W. Swingle (*Physiol. Rev., 6 (1926), No. 1, pp. 28–61*).—This is a review of the chromosome explanation of sex determination, including references and discussions of various irregularities and cases of sex reversal which have been reported by various investigators.

FIELD CROPS

[Field crops experiments in Mississippi, 1925], J. F. O'Kelly, J. C. C. Price, C. T. Ames, E. B. Ferris, W. E. Ayres, and C. B. Anders (*Mississippi Sta. Rpt. 1925, pp. 11, 12, 25, 34, 35, 36–38, 43, 44, 45–50, 53, 54*).—Agronomic investigations (E. S. R., 55, p. 527) at the station, including breeding and varietal studies with cotton (E. S. R., 55, p. 33), corn, and soy beans, variety and slip-cutting tests with sweet potatoes, and tests of silage crops are reported on, and summary accounts are given of experiments at the Holly Springs, South Mississippi, and Raymond Substations, largely noted previously (E. S. R., 55, p. 228). Work at the Delta Substation embraced variety and cultural tests and breeding work with cotton, corn, soy beans, and oats, fertilizer tests with cotton (E. S. R., 55, p. 334) and corn, and variety trials with sorghum, including a strain termed "Sagrain," said to have a sweet stalk and a head resembling that of kafir.

[Field crops work in Nebraska, 1925] (*Nebraska Sta. Rpt. [1925], pp. 13, 14, 21, 22, 25, 26, 30, 31, 34, 35, 36, 37*).—Continued breeding work with corn gave indications similar to those already recorded (E. S. R., 54, p. 328). Inbred strains were found less efficient in their use of water than hybrids. Italian-grown red clover was inferior to native seed, and alfalfa from foreign sources winterkilled severely. Harvesting early potatoes at intervals from July to October gave indications that tuber formation practically ceased about August 15, whereas the tubers continued to increase in weight up to early September. Tests of 151 wheat samples of the 1925 crop obtained in a survey showed the average protein content to be 11.2 per cent, about 1 per cent less than the average of 1923 and 1924 (E. S. R., 54, p. 333), although the baking quality of the 1925 crop was higher.

In a hot, dry season at the North Platte Substation the respective average acre yields on continuously cropped land and summer-tilled land were from winter wheat 11.9 and 28.1 bu., oats 17.7 and 39.4, and corn 14.5 and 35.1 bu. The lowest yields of the year were in rotations receiving barnyard manure. Varietal leaders included Nebraska No. 60, Kharkof, and Kanred winter wheat, Nodak, Marquis, and Kubanka spring wheat, Sandrel barley, and Markton oats. Feterita, hegari, and milo led the sorghums, yielding 44.5, 41.5, and 41 bu. per acre, respectively, as compared with 27 bu. from corn.

Outstanding in crop rotation work at Scottsbluff were the increased yields obtained either by the use of barnyard manure or by a sequence including a legume crop. Yields of potatoes, sugar beets, and oats were increased by about 80 per cent through applications of barnyard manure. The yields of these crops and of corn and wheat were fully double where they followed alfalfa in the rotation as compared with unmanured plats. Beets on plowed land gave

about 1.5 tons more per acre than on disked land, and the stand was almost in direct ratio with the yield.

Kubanka spring wheat, Kanred winter wheat, and Nebraska No. 21 oats were the leading varieties at the Valentine Substation. A smooth type of corn produced 10 per cent more than the rough type, and sorgos yielded 60 per cent more forage than the grain sorghums. Cultural and production tests with sorghums and legume forage crops are also noted.

[Field crops work in Oregon, 1923–1924] (*Oregon Sta. Bien. Rpt. 1923–24, pp. 34–42, 55, 80, 81, 83, 88, 89*).—Experimental work reported on from the station and substations in continuation of previous work (E. S. R., 49, p. 525) was concerned with variety tests with winter and spring wheat, corn, oats, barley, seed flax, soy beans, seed and forage vetches, alfalfa, red clover, sweet clover, mangels, carrots, potatoes, and miscellaneous grasses; cultural (including seeding) trials with winter and spring wheat, potatoes, seed and forage vetches, horse beans, Tangier peas, alfalfa, and red clover; fertilizer tests with potatoes and red clover; seed treatment with cereals and potatoes; breeding work with winter wheat, grasses, sweet clover, red clover, and vetches; seed production studies with grasses and rape; inoculation tests with legumes; rotations; trials of pasture mixtures; and miscellaneous tests with zigzag, bur, and Ladino clovers, sweet clover, field peas, creeping bent, reed-canary, and Harding grasses, sugar beets, artichokes, and various plant novelties. The leading crop varieties for dry land and irrigation, together with optimum rates and dates of seeding are indicated from results obtained at the Harney Substation.

[Field crops work in Nigeria], T. G. Mason et al. (*Nigeria Agr. Dept. Ann. Bul. 4 (1925), pp. 3–31, 109–119, 122–217, pls. 3*).—Further studies with field crops (E. S. R., 53, p. 335) are reported on from the Moor, Umuahia, Agege, Ilorin, and Samaru experimental farms and the Maigana Seed Farm.

In a paper entitled A Survey of Factors Affecting the Development of the Cotton Plant in the Oyo and Abeokuta Provinces of Southern Nigeria, Mason and C. H. Wright conclude that experiments in two areas did not reveal significant differences in the yielding capacities of American and native cotton. The total number of open bolls per acre produced by American cotton seemed largely a function of the specific conductivity of the 1:5 soil extract. Differences in the percentages of bolls shed, spacing, etc., were apparently of secondary importance. In native cotton, however, the total number of open bolls was influenced by the salt content of the soil and by the hygroscopic coefficient of the subsoil. The numbers of bolls were probably also affected by damage to the plant caused by *Helopeltis* spp. and *Pseudomonas malvacearum*. This damage was probably correlated with the hygroscopic coefficients, since compensatory growth is not usually marked on light soils. Damage by bollworms and disease in the later phases of boll development resulted in great crop loss in both cottons. In American cotton lint staining was intimately associated with the internal boll disease, while in native cotton anthracnose was probably a greater factor than internal boll disease in lint staining. A tendency of native cotton to delay flowering until after the rains was not seen in American cotton. A new disease of cotton for which the term "leaf roll" is suggested was discovered.

Alfalfa-growing in the United States and Canada, G. Stewart (*New York: Macmillan Co., 1926, pp. XXIII+517, figs. 118*).—A practical discussion of the factors involved in the production of alfalfa hay and seed is presented, with useful information on the utilization of the crop. The text is based extensively on the results of investigations with the crop at the experiment stations in the United States and Canada and by the U. S. Department of Agriculture.

The successive chapters treat of the increasing importance of alfalfa; history of alfalfa; the plant and its varieties; adaptation—climate, water, soil, and variety; soil improvement and crop rotation; inoculation and fertilizers; seed bed, seed, and seeding; care of the growing crop and weed control; irrigation of alfalfa; cutting and curing alfalfa; hauling, storing, and marketing; seed production; diseases, insects, and rodent pests; chemical composition and energy values; and feeding value of alfalfa. A comprehensive bibliography on alfalfa is included.

Fertilizer experiments with alfalfa conducted at the United States Yuma Field Station, Bard, Calif., 1919 to 1925, H. L. Westover and E. G. Noble (*U. S. Dept. Agr. Bul. 1418 (1926), pp. 11, fig. 1*).—Marked improvement in the growth of alfalfa from applications of acid phosphate was indicated in the experiments reported on. There appeared to be little choice between 16 per cent and 44 per cent acid phosphate, provided equivalent amounts of phosphoric acid were applied, the cheaper form being suggested. The benefit from barnyard manure did not justify paying much for it in view of the cost of hauling and application. Neither gypsum nor sulfur appreciably affected alfalfa yields. In preliminary tests plats receiving acid phosphate have yielded considerably more seed than comparable checks.

Production of alfalfa on the Yuma Reclamation Project is described briefly.

Alfalfa variety tests, J. C. Overpeck and W. T. Conway (*New Mexico Sta. Bul. 152 (1926), pp. 11, fig. 1*).—Cut 5 times per year during 5 years, Hairy Peruvian alfalfa averaged 6.97 tons per acre, common 4.98, Grimm 4.85, and Turkestan 4.17 tons. The second usually was the heaviest of the five cuttings. Hairy Peruvian seems superior for southern New Mexico while Grimm is generally recommended for high altitudes and the northern counties.

Comparative shrinkage in weight of alfalfa cured with leaves attached and removed, H. L. Westover (*U. S. Dept. Agr. Bul. 1424 (1926), pp. 11*).—Tests at Redfield, S. Dak., and also at Bard, Calif., North Ridgeville, Ohio, and Arlington, Va., showed that in every case where the leaves were picked from the stems alfalfa dried out somewhat faster than where allowed to cure in its natural state. Alfalfa in the quantities used (generally 100-gm. samples) appeared to cure at least as rapidly with leaves removed as with them attached. Contrary to general belief, in one test stems with leaves attached cured no faster than stems with leaves removed. Leaves attached to the stems seemed to lose moisture as rapidly as detached leaves. At the beginnings of the tests and when the plants were air-dry, stems and leaves were almost equal in weight, although the stems in most cases considerably outweighed the leaves during the intervening time because they lost moisture less rapidly. In most cases the alfalfa lost weight at about the same rate whether the leaves and stems were dried separately or mixed. Alfalfa lost moisture more rapidly in the sun than in shade, but comparative results from curing with leaves attached and with leaves removed were quite similar.

Cooperative cotton variety tests, M. Nelson and J. O. Ware (*Arkansas Sta. Bul. 210 (1926), pp. 3–23*).—Field data from cooperative variety tests with cotton in different localities in Arkansas during the years 1920–1924, inclusive, showed that in most of the tests, particularly those in northern Arkansas, early varieties such as Trice, Express, and Delfos have given good results. In central and southern Arkansas medium early sorts represented by Acala and Cleveland have usually outyielded such later types as Mebane, Triumph, and Lone Star.

Varieties of cowpeas for seed and hay production, M. Nelson and C. K. McClelland (*Arkansas Sta. Bul. 212 (1926), pp. 3–22*).—The yields of cowpea varieties tested for seed production during the period 1908–1925, and for hay

production from 1915–1924, inclusive, are summarized, with information on planting and cultural methods.

Groit, New Era, Brown Sugar Crowder, Arlington, Whippoorwill, Black Unknown, Red Ripper, and Early Black have given best results in seed production, while Brabham, Monetta, Iron, Warren New Hybrid, Wonderful, Black, Red Ripper, and Taylor have given the best hay yields. Groit, Brabham, New Era, Whippoorwill, and Iron are indicated as general purpose varieties.

Observations during the tests suggested that early planted peas should be seeded in rows and cultivated, while late planted peas may be sown solid or broadcast with little difficulty from weeds. Production cost and labor in cultivation may be reduced by using the spike tooth harrow in addition to the cultivator, the peas being harrowed across the rows during the hottest part of the day. Mixtures of cowpeas with crops other than soy beans were unsatisfactory.

Potato growing in Missouri, J. T. Quinn (*Missouri Sta. Bul. 240 (1926), pp. 32, figs. 24*).—Field practices and cultural methods are recommended for the production of potatoes, on the basis of experiments at the station, and information is given on soils, crop rotations, varieties, planting, diseases and insects, harvesting, grading and storage, and the culture of late and straw potatoes. See also previous reports (E. S. R., 47, p. 35; 49, p. 229).

Fertilizer trials showed acid phosphate in combination with barnyard manure to give economical returns. The maximum acre yield, 327.9 bu., followed the use of 400 lbs. of a 3–12–4 fertilizer plus 8 tons of barnyard manure with soy beans as a green manure. With a complete fertilizer the greatest net returns accrued from applications of from 400 to 500 lbs. per acre.

During 3 years certified northern-grown seed potatoes showed an increase over spring home-grown seed of 22.7 bu. for Irish Cobblers, and 25.6 bu. for Early Ohios. According to date of planting tests, on the average for central Missouri, plantings between March 20 and 30 made the highest yields. The corrosive sublimate and hot formaldehyde methods of seed treatment gave respective average acre increases of 27.1 and 22.8 bu.

Rates of planting soybeans, M. Nelson and C. K. McClelland (*Arkansas Sta. Bul. 211 (1926), pp. 8*).—In a 1-year test, Laredo soy beans made highest average seed yields, 10.35 bu., at a 7-lb. acre rate with a gradual yield decrease to 7.58 bu. with the heaviest rate, 56 lbs. The same tendency was not seen in Mammoth Yellow in rates from 14 to 63 lbs. per acre. Straw yields were evidently not related to the seeding rate. Data on germination, percentage of good seed, and seed per pound from the several seeding rates are also tabulated.

[Experiments with sugar cane in Java, 1925], J. Kuyper (*Arch. Suikerindus. Nederland. Indië, 34 (1926), No. 3, pp. 59–81; abs. in Facts About Sugar, 21 (1926), No. 13, p. 304*).—The results of 424 field tests made to determine the optimum amount of ammonium sulfate to be used as fertilizer indicated a range between 310 and 465 lbs. per acre for Java as a whole, varying with soil and variety. The optimum for D. I. 52 was often as much as 620 lbs. per acre, while that for E. K. 28 was less. Ninety field tests with phosphatic fertilizers did not admit of general conclusions. Artificial manure (huminified rice straw with slight addition of ammonium sulfate) gave noticeably better results than stable manure. Most of the tests of the fertilizing value of molasses were favorable, the best results being obtained on coarse, sandy soils.

When E. K. 28 was planted several successive years on the same ground its susceptibility to root rot appeared to increase, but this did not seem so likely when E. K. 28 followed some other variety. Rotation is apparently as desirable with different varieties of the same crop as with different crops.

While results of 130 spacing tests showed that row spacing is governed by local conditions, in general the wider spacings are not favorable. The optimum fertilizer application had no connection with the spacing of the rows. Extensive varietal trials are also reported on.

Sugar cane seedling optimum culture, R. L. DAVIS (*Planter and Sugar Manfr., 76 (1926), No. 17, pp. 328–330, figs. 3*).—Further studies (E. S. R., 54, p. 832) in the production of sugar cane seedlings at the Porto Rico Experiment Station indicated that because of the variation in amount of fuzz per arrow the seeding rate should be determined by weight. A satisfactory rate is about 25 gm. of fuzz per square foot, which gives a wet layer of fuzz 0.25 in. in depth. Application of 2 gm. of a complete fertilizer in 15 cc. fine sand per square foot just after wetting down the fuzz layers resulted in from 15 to 30 per cent higher germination and more rapid growth. Fuzz stored with quicklime in air-tight containers produced more viable seedlings than fuzz exposed to free circulating air. Seedlings grew much better in the greenhouse than in the open, although suckering was more profuse in the open. Seedlings allowed to remain in the germination flats until ready for the field grew decidedly better than those transplanted. Mayaguez cachaza seemed undesirable as the sole ingredient for germination flats or for transplanting, and was only a fair substitute for manure when mixed half and half with sandy river loam. The seedlings germinated better and grew better during the first 2 months in the mixed than in pure cachaza.

Influence of the time of planting sugar cane on sugar production [trans. title], C. E. VAN DER ZYL (*Arch. Suikerindus. Nederland. Indië, Meded. Proefsta. Java-Suikerindus., 1925, No. 14, pp. 443–496, figs. 8*).—During the period 1913–1924, 81 time-of-planting tests were made with sugar cane in Java. An optimum time of planting which appeared to result in maximum yields was observed. In years with heavy rainfall during October and November, May and June seem to be favorable months for planting, while in years with slight rainfall in this period June and July are about equal. According to results obtained with different varieties, early planting seems preferable with late sorts such as E. K. 28 and 247 B. There is a greater liability of reduced yields resulting from plantings made in July than from May plantings.

Growing sunflowers for silage in Idaho, H. W. HULBERT and J. H. CHRIST (*Idaho Sta. Bul. 141 (1926), pp. 12, figs. 3*).—Information presented on the culture and feeding value of sunflowers (E. S. R., 54, p. 736) is based upon investigations at the station and the Sandpoint Substation and experience elsewhere in Idaho. The use of the Mammoth Russian variety, planting mid-early at the station and early at Sandpoint, and thick stands have been conducive to high yields. Sunflowers should not precede winter wheat in the crop rotation. The choice between corn and sunflowers as a silage crop for a locality will depend upon comparative yields and ease of handling. Analyses showed that the two crops are nearly equal in feeding value.

Sweet clover seed studies, O. A. STEVENS and H. D. LONG (*North Dakota Sta. Bul. 197 (1926), pp. 20, figs. 8*).—The growth and flowering habits and seed characteristics of biennial white (*Melilotus alba*) and yellow (*M. officinalis*) sweet clovers were studied in comparison, and the influence of maturity, freezing, longevity, scarification, and the hull upon the germination of sweet clover seed was observed.

M. alba begins to bloom about June 25 at Fargo, and flowers may be found until freezing weather. The blooming of a single raceme bearing from 75 to 100 flowers may extend from 10 to 14 days with not over one-third of the flowers open at one time. *M. officinalis* began to bloom about 10 days earlier, and the progression of flowering was about twice as rapid.

From 4 to 5 weeks were required from flowering to mature seed in midseason and 6 weeks late in the season. In mature dry fruits the pod comprises about 20 per cent of the total weight with no differences indicated between the species. While pods are usually 1-seeded, 2-seeded pods were frequently noted and their seeds were somewhat flattened or irregular. Purple flecks appeared to reliably indicate *M. officinalis* in seed samples but not to determine accurately its proportion in the mixture.

Germination tests showed that mature seeds are normally hard coated and will not germinate promptly unless the coat is scratched or broken, whereas somewhat immature seeds of about three-fourths normal weight germinate more readily. Seeds not more than three-fourths developed appeared to be killed by freezing in fresh condition. The data indicated that much of the seed may become permeable by remaining on the plants over winter. Slight change was apparent in the germinability of normal seeds stored as long as 15 years, whereas heavily scarified seeds lost their vitality during the first year or two. Seedlings breaking apart at the hypocotyl seemed due to either broken or immature seeds. More than half of seed threshed without special hulling or cleaning is usually hulled and about one-third of such hulled seed is scarified enough for prompt germination. Seeds remaining unhulled were of the same quality as the others. Variations in analyses of this uncleaned seed were held due to the difficulty of securing representative samples.

Winter wheat in North Dakota, T. E. Stoa (*North Dakota Sta. Circ. 35* [*1926*], *pp. 12, fig. 1*).—This is a revision of Bulletin 169 (E. S. R., 50, p. 33), omitting information on winter rye (E. S. R., 54, p. 332).

Winter wheat on fall plowing, fallow, or corn ground has usually winterkilled badly at the station, although in certain recent years seedings in stubble made fair yields. Winter wheat has generally been inferior to spring wheat at Dickinson and Williston. Mild winters, snow cover, and good moisture in the fall and early spring seem to favor success with winter wheat. Growers most successful during recent years have seeded the wheat in tall, clean grain stubble, which offers maximum opportunity to retain snow. Minturki is indicated as a hardy variety for the State.

Relation of kernel texture to the physical characteristics, milling and baking qualities, and chemical composition of wheat, J. H. Shollenberger and D. A. Coleman (*U. S. Dept. Agr. Bul. 1420* (*1926*), *pp. 16, figs. 5*).—Milling, baking, and chemical tests were made on wheat kernels of dark, hard, and vitreous or amber, spotted or mottled, and yellow or starchy types of texture that had been hand separated from three special samples each of hard red winter and hard red spring and two of durum wheat. Although the experiment and conclusions given dealt chiefly with differences in quality among the kernel texture types within the same sample, wide differences were evident between samples of the same class or variety when grown under different conditions.

Of the three kernel texture types, the dark type for the classes of wheat studied was consistently highest in specific gravity, usually highest in flour yield and color of loaf, decidedly superior in water absorption, weight of loaf, and crude protein content, and slightly higher in ash, crude fiber, and acidity. In the hard red spring and hard red winter wheats, but not in the durum, the dark type of kernel also slightly excelled in loaf volume and bread texture. The mottled kernel type was somewhat superior in test weight per bushel and weight per 1,000 kernels, but in most of the other qualities was of medium grade. The starchy type of kernel slightly surpassed the other types in average fat content of wheat and in bran yield for all wheat classes tested, and in the durum samples produced the bread of greatest volume

and of best texture. In nearly all the important milling and bread quality factors the starchy kernels, except of the durum samples, were inferior to the other types.

The dark kernel separations averaged lowest in fat content of wheat, the mottled kernel separations lowest in bran yield, milling gain, and crude fiber in wheat, and the starchy kernel separations lowest in all other factors listed. From these averages the dark kernels seemed decidedly superior to the other types of kernels and the starchy kernels as decidedly inferior.

The sow thistle, O. A. Stevens (*North Dakota Sta. Circ. 32 (1926), pp. 16, figs. 12*).—The characteristics of sow thistle (E. S. R., 52, p. 231) and its means of dissemination are described, and methods of prevention and control are outlined.

Studies in the genus Xanthium [cocklebur], J. L. Symons (*Bot. Gaz., 81 (1926), No. 2, pp. 121–147, pls. 3*).—Investigations at McGill University with the cocklebur were concerned with the taxonomy, genetics, cytology, and physiology of the genus.

X. italicum, *X. pennsylvanicum*, *X. inflexum*, and a form thought to be *X. orientale* but resembling *X. curvescens* are commonly found on the shores of the St. Lawrence River at Montreal. These species blossom at about the same time, and experiment showed that interhybridization is possible. Plants of all species studied and some hybrid forms, when forced in the greenhouse, produced some *X. wootoni* burs which were also seen on wild plants of *X. italicum*. In hybrids the characters of *X. italicum* apparently are dominant to those of the other three species. In the species and hybrids thus far investigated the reduced chromosome number was 18.

Marlatt's suggestion (E. S. R., 2, p. 746) that *Trypeta aequalis* Loew is an important natural enemy of Xanthium has been confirmed by observations upon 1,000 burs from the southern United States. It was found that sometimes both seeds in a bur were attacked by the insect, although it was usually only one, and more often the lower. Garden observations upon delayed germination showed that the bur is an important factor in causing delay in nature. When both seeds in a single bur germinated the seedlings were often equal in size and strength, while only rarely was one much more vigorous than the other. The tendency to produce two plants the first season seemed to be characteristic of some varieties. Other varietal differences were noted among progeny of different plants of the same species.

HORTICULTURE

Annual report of the horticultural department, J. C. C. Price (*Mississippi Sta. Rpt. 1925, pp. 23, 24*).—Measurements of the growth of nursery peach trees showed in every case that June buds outgrew 1-year-old trees, and that in the 1-year-old group the smaller sizes are superior to the larger. Of 10 grades of nursery trees, those from 18 to 24 in. tall made the most satisfactory growth, being graded at 92 per cent as compared with 41 per cent for the average of all the grades. Among pecans, Schley seemed least injured by drought in 1924, setting a good crop of nuts in 1925, while many others, including Frotscher, Moneymaker, and Van Deman, produced scarcely a trace of bloom. Furthermore, observations on nuts produced in 1924 showed little reduction in size in Schley, while Stuart nuts were less than half normal size. An apparent relation between color and the amount of anthracnose was noted in grapes, the red labrusca and white labrusca vinifera hybrids being resistant, while red labrusca vinifera hybrids were very susceptible. Varietal notes on various fruits and on the tomato are included.

[Horticultural investigations at the Oregon Station] (*Oregon Sta. Bien. Rpt. 1923–24, pp. 51, 58, 59–66*).—A progress report for the two years ended June 30, 1924 (E. S. R., 49, p. 532).

Studies of the relation of leaf area of a single spur to its chemical composition and fruiting performance gave further evidence that fruit-bud formation does not occur without adequate leaf surface. Studies by G. H. Harris upon the growth of the roots of fruit trees in winter showed that, in general, there is no rest period in the region around Corvallis. Growth was practically continuous so long as the temperature of the soil stayed above 0° C. and the water table kept below the roots. Submergence was more harmful than low temperature, as water-logged roots failed to resume growth after the recession of the water.

Pollination studies with filberts, sweet and sour cherries, pears, apples, and chestnuts showed that practically all varieties of these fruits, as well as the Mammoth blackberry are self-sterile, and that cross-pollination with compatible forms occurs readily. Ettersburg 121, used frequently in strawberry crosses on account of its good canning quality, was found very prepotent in transmitting its vegetative characteristics. The Golden Delicious apple proved unsatisfactory for western Oregon on account of a tendency to develop a dry skin having poor keeping qualities. Attempts to propagate filberts by cuttings failed. The results of studies of the relation of humidity to the storage of filberts are again discussed (E. S. R., 51, p. 538), as are also those upon the harvesting and storage of pears and apples (E. S. R., 51, p. 839) and those upon the storing and harvesting of cherries (E. S. R., 53, p. 440).

The injection of carbohydrates in the form of sucrose and glucose into Anjou pear trees at blossom time was followed by a temporary reddening of the foliage. No material effect on the set of fruit was noted.

An examination of the beets of different strains of several varieties showed wide differences in the interior color. Even in the very best strains there were found 19 per cent of undesirable canning beets because of a zonation of color. In a trial of various fertilizer combinations, a complete fertilizer was found valuable in the production of onion sets. Soil variability, drainage conditions, and insects materially influenced onion yields. Pollination greatly increased the yield of greenhouse-grown tomatoes (E. S. R., 50, p. 834).

Work with walnuts indicated that adequate drying may be obtained in from 24 to 36 hours at a temperature of 100 to 105° F., with a circulation of air running from 250 to 500 ft. per minute. The occurrence of hydrogen in canned gooseberries was found to be associated with sulfur used in spraying and dusting this fruit after the berry was formed. Skim milk, clabbered milk, and dried skim milk were found valuable as spreaders in orchard sprays and also for emulsifying cold mineral oil emulsions.

[Horticultural investigations at the Hood River, Oreg., Substation] (*Oregon Sta. Bien. Rpt. 1923–24, pp. 85–88*).—Studies conducted in 1923 indicated that nitrogen is the limiting factor in the typical Hood River soils. Sulfur and calcium were also deficient in certain types. In respect to acidity, soils were either neutral or slightly acid in reaction. Determinations in 1924 at two-week intervals of the percentages of nitrogen available in the form of ammonia and nitrate nitrogen showed a consistently high percentage of nitrate nitrogen in cover crop soils. Certain soils, notably Underwood loam, showed a high degree of nitrifying capacity. As late as May 1, no nitrate nitrogen was found in the Parkdale loam at an elevation of approximately 1,500 ft., although there was an appreciable supply of humus and ammonia present. Fertilizer tests in orchards were continued (E. S. R., 49, p. 532), and again showed the value of quickly available fertilizers in the lighter soils. The re-

moval of alfalfa hay from a yellow Newtown orchard gave unfavorable results as compared with no cutting, or cutting without removal. Biennial and annual sweet clovers gave promising results as cover crops. Cuthbert raspberry yields were greatly increased by the application of nitrate of soda and superphosphate on sandy soils and nitrate of soda and sulfate of potash on heavier types.

The results of a pruning test with young Anjou pear trees favored no pruning, and the tying down of limbs stimulated early production. Time of picking tests with Esopus (Spitzenburg) and Yellow Newtown apples generally favored relatively early picking from the viewpoint of keeping quality. No evidence was obtained to indicate that nitrate of soda in moderate applications induced poor keeping quality. Anjou pears picked later than the commercial harvest developed better quality in storage. Studies with Yellow Newtown and Ortley apples indicated clearly that thinning the fruit results in larger yields and more uniform grades. For Ortley 4 in. and for the heavier bearing Yellow Newtowns from 6 to 8 in. are suggested.

[Horticultural investigations conducted by the Philippine Bureau of Agriculture] (*Philippine Bur. Agr. Ann. Rpt. 24 (1924), pp. 65–82, 89–98, pls. 3*).—This report, like that of the preceding year (E. S. R., 54, p. 140), consists largely of brief notes on the progress of miscellaneous investigations.

In a test at Lamao of the effect of different treatments on the germination of papaya seed, the best results, 80.48 per cent, were secured with seed washed thoroughly and dried at room temperature. Drying in the sun apparently hastened germination. Papaya plants propagated from cuttings made such poor growth that this method of increase is deemed impracticable. Observations on the sex of papaya trees resulting from seed taken from different portions of the fruit showed a slightly higher percentage of male seedlings from the middle portion. No correlation was found between sex and root characters in papaya.

Of 16 varieties of legumes tested at Lamao, segnidilla seemed best adapted as a cover crop for citrus. Coffee seed stored in moist moss retained its viability for 15 months, as compared with only 2 months in dry cloth bags or paper envelopes. Further attempts to propagate mango by cuttings or marcottage were unsuccessful. A wrapping of moss increased the percentage of success in mango grafting, especially during the dry season. Carabao mango fruits dried in the sun and afterwards placed in sterilized glass jars kept 5 months to 1 year. In a test of fertilizers for the pineapple, nitrogen carrying materials gave the best results.

At Tanauan Batangas mandarin on their own roots did better than those on calamondin or rough lemon. On the other hand, rough lemon proved a satisfactory stock for grapefruit and all the other lemons. Satsuma orange thrived best on calamondin roots. The smudging of mandarin trees for nine consecutive days was highly successful in stimulating fruiting. The addition of sulfur decreased its effectiveness. Fertilizer and cover crop tests showed that the trees often suffer from lack of fertility, and phosphoric acid seemed the most important material. Batangas mandarins held in a cement lined underground chamber kept quite satisfactorily for eight weeks.

Nutrient needs of greenhouse tomatoes, F. T. McLean and F. R. Pember (*Rhode Island Sta. Bul. 205 (1926), pp. 3–16*).—The results of investigations begun in the fall of 1919 and continued into the summer of 1925 with tomatoes and other vegetables growing in greenhouse beds and benches and submitted to differential fertilizer treatments showed, almost without exception, that animal manures were more effective than chemicals in increasing yield. That the effectiveness of manure may be due to other causes than the amounts of

the principal fertilizer elements was indicated in the results of analyses made in the spring of 1922 of the nitrogen, phosphoric acid, and potash contents of plants from the various treatments. It was shown that plants and fruits from low-yielding plats insufficiently supplied with nitrogen, phosphoric acid, and potash did not show a corresponding reduction in these deficient elements in the percentage composition. Conversely, well-nourished cultures did not show a marked surplus of these nutrients, except in the case of manured and fertilized plants, which showed an extremely high content of potash. In all cases tomato fruits were richer than their vines in all elements, especially potash. The dry matter composition of well-nourished tomato plants was approximately as follows: Vines 2.0, 0.7, 1.8, and fruits 2.7, 1.0, and 4.8 per cent, respectively, of nitrogen, phosphoric acid, and potash.

Data obtained in the 1923 and 1924 seasons, when very low rations of fertilizer were given in order to study the effect of deficiencies, showed that low nitrogen or low phosphoric acid materially reduced yields. In respect to potash, the soil used apparently contained sufficient to supply the needs of the plants. In 1924, one culture receiving ample nitrogen and phosphoric acid in chemical forms outyielded all others.

In the 1924–25 season, tomatoes were set out in the autumn and carried through the winter and following spring. As compared with spring planting, used in the preceding years, the total yields were higher and monetary returns better in the case of the winter crop. Of four varieties, Bonny Best, Comet, John Baer, and Winter Beauty, Bonny Best led in yield and in symmetry of the fruit, but the size was too small during the winter season.

Orchard practices [at the Southern Oregon Substation, Talent] (*Oregon Sta. Bien. Rpt. 1923–24, p. 94*).—Applications of nitrogen in the form of nitrate of soda, ammonium sulfate, or dried blood gave favorable results in peach, pear, and apple orchards located on light soils and with old trees on heavy soils. On the other hand, phosphoric acid and potash gave no appreciable results. Of many legumes tested as cover crops on heavy adobe soils, Hungarian and woolly podded vetches gave the best results and are considered to have contributed greatly to the success of orcharding in southern Oregon. Experiments in orchard heating showed that this operation is necessary in the low valley orchards.

Fruit and the fruit trade, F. Fairford (*London and New York: Isaac Pitman & Sons, 1926, pp. XII+154, pl. 1, figs. 42*).—This contains popular information concerning the source, culture, and methods of handling various fruits which enter the world's trade.

Commercial apple industry in New Hampshire, G. F. Potter and H. A. Rollins (*New Hampshire Sta. Bul. 223 (1926), pp. 38, figs. 8*).—Data obtained in a survey of commercial apple orchards in the summer of 1925 include information from 804 farms, representing approximately 352,000 trees, about two-thirds of which are in their productive age. Baldwin was by far the leading variety, making up more than 50 per cent of all the trees. Following Baldwin in descending order were McIntosh, Wealthy, Delicious, Gravenstein, Northern Spy, and Wagener, with a multiplicity of less important varieties. McIntosh, in particular, showed very rapid expansion in recent years, and Delicious also had made considerable progress.

Of 927 reports upon methods of culture employed, 76 per cent fell in the sod and sod-mulch group, 19 per cent in the cultivation and cover-crop group, and 5 per cent in the cultivation intercrop group. Of 797 reporting on fertilizers, 7.3 per cent used none, 60 per cent fertilized annually, and 32 per cent at irregular intervals. Approximately 95 per cent of the reporting growers pruned their trees. Spraying or dusting was carried out on 726 of 803 farms visited.

Thinning of fruit was being tried on 17 per cent of the farms. An analysis of marketing data showed that more than half of the New Hampshire apples are sold on the unclassified basis, i. e., without grading, except for the removal of culls. A large proportion of the fruit was disposed of at the orchard to country buyers, and the barrel is the most favored package except for the better grades of McIntosh.

In conclusion, the authors point out that the rapid expansion in commercial orcharding in New Hampshire will necessitate the development of new markets for the better grades of fruit, and incidentally force growers to use the best methods of culture and management to produce high-grade fruit. With attention to these matters and cooperation, an optimistic outlook is forecast.

The metabolic drift in apples: The pectic changes, H. M. Carré (*In Imperial Botanical Conference, London, 1924. Report of Proceedings. Cambridge: Univ. Press, 1925, pp. 24, 25*).—An abstract of the paper is presented.

Chemical determinations of the relative proportions of pectose, pectin, and pectic acid in apples during their development and senescence showed gradual changes in these pectic compounds. Soluble pectin, found negligible in unripe fruits, developed in the juice during ripening, apparently at the expense of pectose in the cell walls. Pectin attained a maximum when the fruit reached a mealy condition, and thereafter declined, presumably by hydrolysis into other products. As the cell walls became depleted of pectose, pectic acid and pectates of the middle lamella decreased in amount until the actual breaking down of the tissue occurred.

The rate of senescence and the control of it by conditions.—II, Drift of respiration with senescence, F. Kidd (*In Imperial Botanical Conference, London, 1924. Report of Proceedings. Cambridge: Univ. Press, 1925, pp. 27, 28, fig. 1*).—Part 2 of this paper, an abstract of which is presented, deals with the researches of the author and C. West. There was found a gradual decrease in carbon dioxide production in apples per unit of fresh weight during growth on the tree. The minimum was reached about the time the fruit was normally harvested. After separation from the tree respiration activity was found to increase again, approximately doubling, and then to fall off gradually to the original minimum. In fruits gathered prematurely, respiration continued to decline to a minimum in storage, with subsequent rise and fall. No correlation was observed between this rise in respiration activity and in changes in acid or sugar content.

The Conference pear, S. Johnston (*Michigan Sta. Quart. Bul., 9 (1926), No. 1, pp. 12, 13, fig. 1*).—This brief article comments upon a pear variety which in tests at the South Haven Substation has shown exceptional value by regular bearing of very good-quality fruit.

The strawberry, S. Fraser (*New York: Orange Judd Pub. Co.; London: Kegan Paul, Trench, Trübner & Co., 1926, pp. 120, pls. 11*).—This comprises practical directions for the propagation, culture, harvesting, and marketing of strawberries.

Influence of climate upon the fruiting of the olive [trans. title], D. Casella (*Ann. R. Scuola Super. Agr. Portici, 2. ser., 20 (1924), [Art. 2], pp. 19*).—Records taken at the Royal Institute of Agriculture at Portici, Italy, upon olive trees growing under different conditions showed that climate in its various phases, heat, light, water, air, and electricity, has an important effect on the percentage of aborting flowers. In individual trees of the Ottobratico and Coccitano varieties, the flowers on the lower branches showed a significantly higher percentage of aborting ovaries than did those on the upper limbs.

This phenomenon is deemed by the author to be due in part to the better light conditions in the upper part of the tree. In trees of different ages the percentage of aborting ovaries was lowest in old trees. Observations on trees growing at three elevations, namely, 0, 269, and 984 ft. above the sea, gave conflicting results. In a very dry year the lowest percentage of abortion was found at sea level, while in a rainy season the results were directly opposite. In conclusion, the author points out that while nutrition and cultural management are exceedingly important in olive production, climatic variations play important rôles.

Tea: An historical sketch, R. O. MENNELL (*London: Effingham Wilson, 1926, pp. 63, pls. 9*).—A popular discussion of the historical development of the tea industry.

The pollination of the oil palm (Elaeis guineensis), A. G. G. HILL and T. G. MASON (*Nigeria Agr. Dept. Ann. Bul., 4 (1925), pp. 120, 121*).—Cross- and self-pollination of protected female blossoms resulted in satisfactory sets of fruit despite the fact that the pollen was in one case 84 days old. Nonpollinated protected blossoms used as controls set no fruit.

Nut-tree propagation, C. A. REED (*U. S. Dept. Agr., Farmers' Bul 1501 (1926), pp. II+46, figs. 43*).—A detailed discussion of methods of technique employed in the vegetative or asexual propagation of nut trees, with suggestions as to desirable stocks for various species, including the Persian walnut, black walnut, pecan, hickory, almond, etc.

FORESTRY

[Forestry studies by the Mississippi Station], S. W. GREENE (*Mississippi Sta. Rpt. 1925, p. 57*).—Observations at the Coastal Plains Substation on seedlings surviving the burning over of pasture land showed that those from three to four months old lived through grass fires where there was little grass roughage and no straw-fall. Notes on areas burned over at different seasons showed that summer burning in 1924, a year of unusual drought, was very injurious, killing approximately 20 per cent of trees 20 years old and 6 in. in average diameter. Growth measurements on old, suppressed, but healthy, longleaf pines following the cutting of the merchantable timber showed as much increase in the 4 subsequent years as in the preceding 40 years. Slash pines were budded successfully on loblolly pine.

The Dunbar Experiment Station forest, A. K. CHITTENDEN (*Michigan Sta. Quart. Bul., 9 (1926), No. 1, pp. 13–16*).—A brief discussion of the present condition, constituent species, and proposed plan of management in a newly acquired forest tract in the Upper Peninsula of Michigan. In planting white pine and fir in a stump lot furrowing gave better results than planting in holes.

Lake States Forest Experiment Station report to the advisory committee for 1925 (*U. S. Dept. Agr., Forest Serv., [1926], pp. [3]+39*).—Prepared in mimeograph form, this pamphlet briefly outlines the present activities, aims, and progress of this recently created experiment station.

Forest destruction and slope denudation in the Province of Shansi, W. C. LOWDERMILK (*China Jour. Sci. and Arts, 4 (1926), No. 3, pp. 127–135, pls. 10*).—Surveys conducted in the summers of 1924 and 1925 in Shansi Province, China, which has an estimated content of 91 per cent of mountain land, most of which has a gradient of over 25 per cent, showed that destructive agricultural operations have been instrumental in bringing desolation to what was at one time a luxuriantly wooded and fertile area. Deep tillage of the steep slopes right up to the mountain crests has been followed by soil washing, except in certain small areas where terracing has been systematically fol-

lowed. Intermittent mountain torrents carrying debris to the valleys, now replace the steady flow of wooded streams. The few remaining forests show the natural adaptation of the area to forestry.

The physiography of Southern Nigeria and its effect on the forest flora of the country, J. R. Ainslie (*Oxford: Clarendon Press, 1926, pp. 36, pls. 4, figs. 6*).—A discussion of the effect of soil variations, altitude, etc., upon the composition and distribution of the forests.

Trees of the lower Río Motagua Valley, Guatemala, S. J. Record and H. Kuylen (*Yale Univ. School Forestry, Trop. Woods, No. 7 (1926), pp. 10–29*).—This brief article contains descriptive notes upon the trees and wood of a large number of forest species, representing 84 genera and 38 families. Some of the woods are deemed of potential value in construction and manufacture.

The forests of India, E. P. Stebbing (*London: John Lane, the Bodley Head, 1926, vol. 3, pp. XVIII+705, pls. 122*).—This, the third and final volume (E. S. R., 49, p. 745), contains discussions upon the progress of forest conservancy in the several presidencies and provinces during the periods 1871–1900 and 1901–1925, with comments upon the effect of the World War and constitutional reforms on forest policy.

[Yield tables for Indian forest trees], S. H. Howard (*Indian Forest Rec., 12 (1926), Nos. 4, pp. II+19, pls. 6; 5, pp. [2]+21, pls. 10, fig. 1; 6, pp. [2]+23, pls. 10.*)—These contributions from the Forest Research Institute, Dehra Dun, present yield tables for clear felled sal coppice (*Shorea robusta*), chir (*Pinus longifolia*), and deodar (*Cedrus deodara*).

The ailanthus tree in Pennsylvania, J. S. Illick and E. F. Brouse (*Penn. Dept. Forests and Waters Bul. 38 (1926), pp. 29, figs. 13*).—A report upon the tree characters, rate of growth, manner of reproduction, and distribution of the ailanthus, a species introduced into Pennsylvania about 1784 and which has proved a vigorous competitor with native species. The study was conducted as a result of tests at the Forest Products Laboratory, at Madison, Wis., which showed that ailanthus wood is well adapted to the manufacture of pulp.

Douglas fir [trans. title], G. H. Guth (*Lesnická Práce* (*Œuvre forest.*), *5 (1926), No. 7–8, pp. 313–323, pl. 1, figs. 2*).—Observations in Bohemia upon Douglas fir plantations of various ages up to 47 years indicated that this is the most successful of all the introduced species. Comparisons of growth data in Bohemian plantations with those compiled by the U. S. D. A. Forest Service show nearly as good growth in Bohemia as in the United States. The species is esteemed not only on account of its rapid growth but because of its tolerance to shade, long life, and freedom from insect pests. In mixed plantings the Douglas fir soon suppressed its associates.

Western larch nursery practice, W. G. Wahlenberg (*Jour. Agr. Research* [*U. S.*], *33 (1926), No. 3, pp. 293–300*).—Studies carried on at Priest River, Idaho, by D. R. Brewster and E. C. Rogers and by the author at the Savenac Nursery, Haugan, Mont., upon nursery practice with western larch showed that fall sowing is superior to spring sowing, resulting in earlier germination and in the germination of fewer seeds being held over until the following year. In test plats sown June 6, the seed was covered with ¼, ⅜, ½, ⅝, ¾, and 1 in. of clean, sifted, undecomposed granite sand, and the best survival was obtained in the ¼- and ⅜-in. plats. Where irrigation water is readily available, broadcasting seed was found more satisfactory than drilling, being lower in operating cost and tending to eliminate weak plants. Seed beds protected with half shade were slower to germinate in the spring but showed less loss during July and August of the first growing season than openly exposed beds,

leading to the suggestion that beds sown in the spring be given one-half shade during July and August, but no earlier in the first season and none at all during the second.

Report on rubber tapping experiments of the Experiment Station, Peradeniya, for 1925, T. H. HOLLAND (*Trop. Agr. [Ceylon], 66 (1926), No. 6, pp. 323–327*).—Records taken for seven successive years upon the comparative yields of trees tapped according to the two- and three-day programs showed the two-day plan to be distinctly superior. These results were corroborated in a second experiment. Trees planted in clumps of 4, at the average rate of 60 trees per acre, made greater trunk girth increase and yielded nearly as much rubber per acre as did trees arranged in solid plantings, 20 by 20 ft. A comparison of the Y and the single-cut methods of tapping showed the former to be the more productive. No significant differences in the yield of rubber were obtained where the trees were tapped on alternate days throughout the entire year; daily during January, March, May, etc.; or daily during February, April, June, etc. The slight fluctuations observed in yields were generally correlated with differences in rainfall.

Yields of rubber from bud grafted trees on Kajang Estate, Sungei Reko Division, F. G. SPRING (*Malayan Agr. Jour., 14 (1926), No. 2, pp. 25–31*).—Records taken on 4-year-old trees budded with scions from productive parents and upon adjacent nonbudded trees showed a distinct benefit from the use of selected buds, the budded trees yielding approximately three times as much rubber as the control trees.

DISEASES OF PLANTS

The nature of plant diseases, E. C. SHERWOOD (*West Virginia Sta. Circ. 41 (1926), pp. 36, figs. 43*).—A popular account is given of some of the causes of plant diseases. A number of the more common ones are briefly described, and the principles of disease control are discussed.

Annual report of the department of plant pathology, D. C. NEAL (*Mississippi Sta. Rpt. 1925, pp. 20–22*).—In continuation of investigations on plant diseases and their control, tests of resistance to ***Fusarium lycopersici*** of 12 varieties of tomatoes are reported. Seed of resistant strains was distributed during the year to practically 10,000 people in the State.

Tests of 16 varieties of oats are reported in which Rustless, Heigira Rustproof, and Iogren appeared to be particularly resistant to crown rust, and Red Rustproof was fairly resistant.

A study of the effect of inoculated sulfur for the control of root knot (*Heterodera radicicola*) on peach trees has been in progress for two years. The plats of trees received applications of 10 and 20 lbs. of sulfur per tree, respectively, and after intervals of 30 and 90 days the soil around the trees was neutralized with ground limestone. H-ion determinations of the soils had been made in the department of chemistry, and the vigor of the trees as compared with checks has been observed.

From a pathological and physiological study of the anthracnose (*Colletotrichum trifolii*) of alfalfa, it was found that this organism is identical with the one occuring on red clover. Inoculation experiments with 17 varieties of alfalfa, carried on both in the field and greenhouse, gave no indication of biological strains of the fungus or any considerable resistance in any of the strains tested. Treating alfalfa seed with corrosive sublimate 1:1,000 for 8 minutes resulted in the elimination of the disease with no injury to germination. Overwintering of the fungus is believed to take place in the old crowns, and infection is disseminated when the new growth starts in the spring.

A study of 35 selfed strains of rye to determine resistance to anthracnose showed various gradations of resistance to the strains used, but no pronounced resistance was obtained.

Some pronounced differences of resistance to the cotton anthracnose is reported to have been observed with 5 leading varieties of cotton.

Plant diseases (*Nebraska Sta. Rpt.* [*1925*], *pp. 24, 25, 26*).—It is reported that for the fourth consecutive season experiments on the overwintering of the urediniospores of stem rust of wheat have given negative results, and it is concluded that these do not overwinter at the station and perhaps not in the entire State. During the summer of 1924 stem rust was collected in every county of the State on wheat, barley, and wild grasses in order to determine what physiological forms are present in Nebraska, whether stem rust spreads from barberry bushes or comes in from the South, whether the same forms are present each year, what form or forms are connected with a rust epidemic, and the correlation between the date and location of the collections and the spread of a form over the State. A total of 130 collections was made, and 13 out of 40 physiological forms of *Puccinia graminis tritici* were identified.

When 579 selections of Crimean wheat C. I. 1435 were inoculated in the greenhouse with 14 physiological forms of *P. graminis tritici* obtained from the collections mentioned above, approximately 100 of the pure line strains were found to be extremely susceptible to all 14 forms of the stem rust. Others were susceptible to only 6 of the physiological forms, but no strain was completely resistant to all the forms.

Department of botany and plant pathology (*Oregon Sta. Bien. Rpt. 1923–24, pp. 66–73*).—A brief statement is given of investigations on the Verticillium wilt disease of potatoes (E. S. R., 55, p. 448) and European canker of fruit trees (E. S. R., 55, p. 452).

A survey of the occurrence of virus diseases of potatoes in Oregon is said to indicate that rugose mosaic is the most important of these diseases at present, but that mild mosaic, witches'-broom, leaf roll, spindle tuber, leaf-rolling mosaic, and giant hill have also been recognized.

Several virus diseases of brambles have been found to cause considerable loss in the State. Among them are mosaic, leaf curl, bramble streak, and dwarf. Fungus diseases, among them spur blight due to *Mycosphaerella rubina*, cane blight (*Leptosphaeria coniothyrium*), raspberry rust (*Phragmidium imitans*), anthracnose (*Plectodiscella veneta*), leaf spot (*Septoria rubi*), and *Ascospora ruborum*, caused more or less damage to raspberries, loganberries, and blackberries. The Armillaria root rot of apple trees has been found to attack strawberries.

Heart rot of fruit trees is said to be quite common, and the use of Bordeaux linseed oil paint for covering wounds is recommended.

Alfalfa stem rot caused by *Sclerotinia trifoliorum* is said to be destructive, as many as 50 per cent of the plants in some fields having been found to be affected.

Tests are reported in progress of formaldehyde and organic mercury compounds in comparison with corrosive sublimate for the control of Rhizoctonia on potatoes. Badly infested tubers treated with corrosive sublimate gave better crops than apparently clean tubers planted without any treatment. Dusting potatoes for the control of late blight was found advantageous on small areas where it was impracticable to spray.

Copper carbonate and sulfur dusts were tested for the control of onion smut, but neither proved as efficient as the formaldehyde drip method of treatment. Copper carbonate reduced germination and gave little co

Copper carbonate is said to have proved superior to any of the dip methods tested for the control of wheat smut. High standard brands of copper carbonate which contain 50 per cent or more of copper gave good control, while lots containing from 10 to 22 per cent gave less control where the seed was heavily infected with smut. Two oz. of high-grade copper carbonate per bushel gave practically perfect control. Some of the organic mercury compounds gave about as good control as low standard copper carbonate, but not equal to the high-grade material. Nickel carbonate and furfural gave poor or no smut control. For the control of smut of cheat, which is said to be grown for hay to some extent, Semesan, copper carbonate, copper sulfate, and hot water reduced smut, while formaldehyde, for some reason, was not as efficient as either of the above.

Comparative investigations of dusts and sprays on apples and pears are said to have confirmed previous conclusions (E. S. R., 49, p. 546) that lime sulfur should not be used, at least after flowering time, on tender-skinned varieties.

[Plant disease investigations at the Hood River Substation] (*Oregon Sta. Bien. Rpt. 1923–24, p. 84*).—Experiments at the Hood River Substation are said to indicate that Boredaux oil mixture can be effectively used for the control of apple tree anthracnose. The presence of the Bordeaux mixture is said not to reduce the value of the oil as an insecticide, except possibly for the control of blister mite.

A study of the root rot organism, *Armillaria mellea*, is said to indicate that there are at least two strains of the fungus. The type found on fir land is not considered parasitic.

First annual report of the department of plant pathology [Seale-Hayne Agricultural College, Newton Abbot, Devon], W. E. H. Hodson and A. Beaumont (*Seale-Hayne Agr. Col. Pamphlet 16* [1925], *pp. 31*).—This department is an integral portion of the scheme of the British Ministry of Agriculture for advisory work, and is responsible for work in the Counties of Devon and Cornwall. This first report includes somewhat general accounts of activities regarding both plant diseases and insect pests.

Colloidal sulphur: Preparation and toxicity, L. E. Tisdale (*Ann. Missouri Bot. Gard., 12 (1925), No. 4, pp. 381–418, pl. 1, figs. 4*).—The urgent need for an effective fungicide which may be used with safety on a variety of plants under diverse conditions has led to the development and testing of methods for the preparation of promising forms of colloidal sulfur for use in practical spraying. The results of testing some of these are here detailed.

The stability of colloidal sulfur preparations was found to depend upon the method of mixing the chemicals, upon the temperature of the solutions, and upon the introduction of protective colloids. Of the practical emulsoid colloids, glue proved to be the most effective in preserving the stability of colloidal sulfur suspensions. Weak alkalies were found necessary.

The colloidal sulfur mixtures prepared were toxic to all forms of fungi tested under laboratory conditions. The products spread and adhere well, causing no injury. Apparently, the toxicity of different forms of colloidal sulfur is to be ascribed to different toxic substances.

Colloidal sulfur freshly prepared from SO_2 and H_2S was effective for the control of carnation rust in the greenhouse. In paste form it crystallizes in about one month, losing its toxic property. The toxic constituent appears to be slightly volatile and to be liberated at a pH value higher than 4.2. This colloidal sulfur preparation is most active at higher temperatures.

Properly modified to suit the requirements for field spraying tests, certain of the products gave good control during 1924 of apple scab.

Studies on the pathogenicity, morphology, and cytology of Nematospora phaseoli, S. A. WINGARD (*Bul. Torrey Bot. Club, 52 (1925), No. 6, pp. 249–290, pls. 3*).—Nematospora is said to be parasitic on host plants over a wide range, in which legumes predominate. Infections are associated with punctures by certain insects. Typically yeastlike usually in its vegetative phase, Nematospora, when grown in tap or distilled water or in very dilute beer wort, produces a rudimentary mycelium, and this is produced also around old colonies on solid media. Nematospora appears to be somewhat closely related to Monospora and Coccidiascus, and it probably forms with these two a natural group of Saccharomycetes.

A cytological study of Puccinia triticina physiologic form 11 on Little Club wheat, R. F. ALLEN (*Jour. Agr. Research [U. S.], 33 (1926), No. 3, pp. 201–222, pls. 9*).—The author reports that Little Club wheat is fully susceptible to *P. triticina* physiologic form 11. On this variety of wheat it is said that the fungus attains its maximum development, the haustoria expand fully, and spores are produced in abundance. The host tissues live, their cell walls (except in the guard cells at the stoma of entry) are not damaged, and the cell contents show the minimum of disturbance or impoverishment. The cells in the infection are reported to be more turgid, and their nuclei expand somewhat and move over to the haustoria. At the period of greatest activity of the fungus the plastids show little reduction in size. Under unfavorable conditions they may be temporarily gorged with starch. Not until extreme old age of the infections were more than 1 or 2 per cent of the host cells found to be destroyed. In the more massive fungus growth on older host plants a few subepidermal mesophyll cells were found crushed by the fungus.

Copper carbonate prevents bunt (stinking smut) of wheat, W. H. TISDALE (*U. S. Dept. Agr., Dept. Circ. 394 (1926), pp. 10, figs. 6*).—The author states that copper carbonate is not satisfactory for the control of the smuts of oats and barley and the loose smut of wheat, but it is recommended for the control of bunt of wheat and kernel smut of sorghum. Directions are given for the treatment of grain with copper carbonate.

***The cause and control of yellow berry in Turkey wheat grown under* dry-farming conditions**, J. S. JONES and G. A. MITCHELL (*Jour. Agr. Research [U. S.], 33 (1926), No. 3, pp. 281–292, figs. 8*).—Yellow berry of wheat, which is considered a manifestation of nutritional disturbance resulting from insufficiency of nitrogen and other elements of plant food, is described. The relation of the occurrence of this disease to dry-farming practice is pointed out, and it is stated that thorough tillage of summer fallow, in contrast to neglect or poor tillage, results in larger yields of grain and straw, both of which are substantially richer in protein and the grain correspondingly less infected with yellow berry. As there are no means feasible as yet for fortifying dry-farmed lands against the gradual depletion of their original supply of nitrogen, it is believed that high efficiency in the control of yellow berry can not be maintained indefinitely by tillage of the summer fallow, no matter how thorough.

Bean dry spot [trans. title], E. SCHAFFNIT and K. BÖNING (*Centbl. Bakt. [etc.], 2. Abt., 63 (1925), Nos. 9–17, pp. 176–254, figs. 20; 18–22, pp. 360–438, figs. 6; 23–25, pp. 481–508, pls. 9*).—A monographic account is presented of studies on bean dry spot, its biological conditions and related organisms, *Colletotrichum (Gloeosporium) lindemuthianum* being accepted as causal.

Potato dusting and spraying in 1925, P. E. TILFORD (*Ohio Sta. Bimo. Bul., 11 (1926), No. 4, pp. 141–144*).—In continuation of experiments in dusting and spraying potatoes (E. S. R., 53, p. 46), during the season of 1925 one series of plats was sprayed four times with 4–6–50 Bordeaux mixture, another four times with a 5–7.5–50 Bordeaux mixture, and a third was dusted four times

with copper-lime dust. When dug the sprayed plats yielded an increase of 60 bu. per acre over the check plats and the dusted ones 72.2 bu. increase.

The conclusion is reached that four applications of either Bordeaux mixture or copper-lime dust give profitable increases in yield, but 4-6-50 Bordeaux mixture is recommended for the commercial grower whose acreage warrants a high-pressure sprayer.

Disastrous effect of mosaic on the McCormick potato, R. A. Jehle (*Maryland Sta. Bul. 282 (1926), pp. 215–219, figs. 2*).—Attention is called to the very great susceptibility of the McCormick potato when grown under Maryland conditions. This variety has been the leading fall-grown potato in Maryland for many years, but the mosaic disease is said to have made it practically worthless for planting under ordinary conditions.

Seed treatment control of Rhizoctonia in Idaho, J. M. Raeder, C. W. Hungerford, and N. Chapman (*Idaho Sta. Research Bul. 4 (1925), pp. 37, figs. 14*).—A study of cultures of *R. solani* isolated from potato tubers received from various parts of the United States is said to have shown marked variations in growth characters, but no definite correlations were found between the size of the sclerotia and the source from which they were secured.

On account of conflicting results reported by different workers on the efficiency of potato seed treatments, the authors tested various methods of treatment. Reports are given of laboratory experiments on the effect of the fungicides on the viability of the sclerotia and of field trials which show the efficiency of the treatments on crop production. Previous experiments had shown that the efficiency of seed treatments was increased when the tubers were sprinkled and kept moist for from 24 to 48 hours before subjecting them to the action of the fungicides (E. S. R., 52, p. 449).

In the experiments here reported presprinkling was again tested with all the fungicides used, with almost uniformly increased efficiency. The type of germination following the corrosive sublimate treatment was characterized by a tuft of mycelium in the center of the inverted sclerotium, while that following the treatment with formalin and furfural was quite spreading. This difference in type of germination is believed to have a definite effect upon the efficiency of these treatments under field conditions. Furfural did not prove to be as efficient as formalin in laboratory trials when used at the same concentrations, time of exposure, and temperature. Du Pont Dust No. 15 when applied to the uncut presprinkled tubers at the rate of 3 oz. to the bushel gave better control under field conditions than any other treatment tested. Copper carbonate dust when used at the rate of 3 oz. to the bushel had a serious effect on the germination of the tubers, which was not noted in connection with any other treatment tested.

Experiments on the control of wart disease of potatoes by soil treatment with particular reference to the use of sulphur, W. A. Roach, M. D. Glynne, W. B. Brierley, and E. M. Crowther (*Ann. Appl. Biol., 12 (1925), No. 2, pp. 152–190, pls. 2, figs. 13*).—Discussion of previous studies and of unusual difficulties is followed by an account of experiments during four years seeking a method of destroying in the soil the sporangia of potato wart disease (*Synchytrium endobioticum*). Steaming the soil is effective but presumably impracticable as a field treatment. The amount of disease was reduced with sulfur, calcium and potassium polysulfides, formaldehyde, dichlorocresol, chlorodinitrobenzene, and nitrobenzene. The pot experiment method was abandoned as impracticable in favor of field experiments.

The incorporation of chemicals into the soil was thoroughly carried out with the Simar rotary tiller, and this thoroughness is found to insure effectiveness. Studies in 1924 centered on sulfur as the most hopeful means on account

of its cheapness and apparent efficiency. At Ormskirk it appeared that ground sulfur used in the amounts 1, 2, 3, 4, 5, and 10 cwt. per acre reduced infection consistently from the initial 73 per cent on the untreated plat to 3 per cent with an application of 10 cwt. per acre. Greater amounts did not give final complete freedom from wart disease, this being attributed to probable recontamination later in the season. It is thought that 11.2 cwt. per acre should be fully sufficient. On the heavy clay subsoil at Hatfield, however, about 40 cwt. per acre were necessary to insure clean plats. Gas works spent oxides as sulfur source proved rather less effective as measured by sulfur content. Sulfur inoculated with *Thiobacillus thiooxidans* showed no advantage over uninoculated sulfur.

The elimination of wart disease by sulfur and its compounds is, apparently, not a simple function of soil reaction. Supposedly, some sulfur product other than H_2SO_4 is the active agent.

Resistance in sugar beets to curly top, E. Carsner (*U. S. Dept. Agr., Dept. Circ. 388* (*1926*), *pp. 8, figs. 4*).—The author reports that there are definite variations among individual sugar beets in regard to susceptibility and resistance to curly top, justifying the hope that a variety of beets satisfactorily resistant to the curly top disease may be developed.

The selection of seed cane, C. W. Edgerton, W. G. Taggart, and E. C. Tims (*Louisiana Stas. Bul. 195* (*1926*), *pp. 3–18, figs. 8*).—The results are given of several years' experiments in the selection of strains of sugar cane more resistant to mosaic and root rot than the usual field run of plant cane.

Increased yields are reported, and strains of sugar cane have been developed which have shown decided tolerance to the mosaic disease, the increased tonnage being attributed to the lessened effect of the diseases. The authors claim that they have demonstrated that it is possible to select plants within a vegetatively propagated variety that show less marked symptoms of the mosaic disease.

A Phytophthora disease of tobacco, W. B. Tisdale and J. G. Kelley (*Florida Sta. Bul. 179* (*1926*), *pp. 159–218, figs. 27*).—In a contribution from the Tobacco Substation the authors give an account of black shank of tobacco, the occurrence of which in Florida has been noted previously (E. S. R., 48, p. 646).

The disease is said to primarily cause a dry-rot of the roots and basal parts of the stems, and frequently the lower leaves are attacked. Outside of the Georgia-Florida tobacco district black shank has been reported from other parts of Florida and Georgia and also from Alabama and Virginia. In Florida it is considered one of the most important tobacco diseases, total failures having been reported from many fields the first year after the appearance of the disease.

The disease is said to be caused by a species of Phytophthora, and it is tentatively considered to be a biological strain of *P. nicotianae*, a species originally described from Java (E. S. R., 8, p. 237).

Thus far tobacco plants only have been found subject to attack under natural conditions, and all commercial types proved susceptible to infection at all stages of growth. The organism was found to persist in the soil for several years, and steam sterilization of infested fields is not considered practicable. No benefit followed field applications of inoculated sulfur, Semesan, Uspulun, or land plaster.

Some progress is reported on the development of strains of Big Cuba tobacco resistant to the disease, but it is claimed that the experiments have not progressed sufficiently to release the resistant strains for commercial planting.

The effect of treating the virus of tobacco mosaic with the juices of various plants, B. M. Duggar and J. K. Armstrong (*Ann. Missouri Bot. Gard., 12 (1925), No. 4, pp. 359–366*).—It appears from experiments with tobacco, pokeweed (*Phytolacca decandra*), Jimson weed (*Datura stramonium*), geranium (*Pelargonium* sp.), cotton, squash, potato (tubers), sweet potato, and apple (Ben Davis) that pokeweed juice inactivates the agency of tobacco mosaic in a relatively short time, although it does not possess general germicidal properties. Further work testing the nature of this inactivation has been planned.

Some chemical factors involved in arsenical injury of fruit trees, N. Mogendorff (*New Jersey Stas. Bul. 419 (1925), pp. 3–47, figs. 5*).—The author reports that peach trees under certain conditions were injured when sprayed with a combination of lead arsenate and dry-mix sulfur lime, but when lead arsenate and self-boiled lime sulfur were applied under the same conditions no injury followed. This led to a study of the effect of water; hydrated lime with and without carbon dioxide; sulfur in several forms; magnesium carbonate and sulfate; calcium nitrate, chloride, phosphate, and silicate; various sodium salts; gypsum; etc., on the stability of lead arsenate.

Acid lead arsenate, which is a very insoluble compound, was found to be easily decomposed in alkaline media with the formation of a basic lead arsenate and liberation of free arsenic acid. A similar decomposition was found to take place if acid lead arsenate comes in contact with soluble chlorides, a chloroarsenate and arsenic acid being formed.

The author claims that when lead arsenate alone is used as a spray on tender foliage it may cause injury, since its decomposition is favored by alkaline or saline media resulting from the salts present in the spraying water or excreted by the leaves. When lead arsenate spray was combined with hydrated or freshly slaked lime it was found to be decomposed and converted into basic lead arsenate and very insoluble basic calcium arsenate. The basic calcium arsenate will be transformed to less basic compounds and then to tricalcium arsenate, which is soluble enough to cause injury. The slow progress of chemical transformation is said to account for the phenomenon that injury from lead arsenate does not appear until several weeks after the spray has been applied.

Rock lime (ground limestone) added to lead arsenate spray will result in arsenical injury, and for this reason neither rock lime, air-slaked lime, nor hydrated lime, which has been exposed to the air for a long time, should be used in combination with acid lead arsenate. Magnesium carbonate is said to also increase the water-soluble arsenic. Where lime is used in combination with lead arsenate spray the author claims it should be either freshly water-slaked quicklime or a high grade calcium lime with a calcium hydroxide content as near to 100 per cent as possible. Although the addition of a small quantity of lime applied as a calcium caseinate spreader increased the water-soluble arsenic, the decomposition of lead arsenate was diminished through the presence of the spreader.

The amount of the water-soluble arsenic formed where dry mix 8–4–50 was used was found to be increased if sulfur was present. If the amount of lime is increased the amount of arsenic rendered soluble is reduced. It is said that no injury is likely to occur if lead arsenate is applied with self-boiled lime sulfur 8–8–50. Dry mix and lead arsenate stored dry for a year did not show any water-soluble arsenic, while lead arsenate and sulfur flour stored dry for a year resulted in the formation of water-soluble arsenic.

From his experiments the author concludes that, theoretically, gypsum is a better material than hydrated lime to use in combination with lead arsenate.

While gypsum does not stick well to foliage, it is believed that this quality could be improved by changing the electric charge of the particles.

An experimental study of the fungal invasion of apples in storage with particular reference to invasion through the lenticels, M. N. Kidd and A. Beaumont (*Ann. Appl. Biol., 12 (1925), No. 1, pp. 14–33, pls. 2, figs. 2*).—Along with a review of related literature and a study of the distribution and number of fungus spores responsible for apple rot, on the surface and in the lenticel cavities, the natural modes of entrance of the fungi have been described and their relative frequency of occurrence approximated. The factors controlling lenticel invasion in storage have been analyzed by a new experimental technique. The cause of spotting has been distinguished as functional rather than parasitic, and the general name lenticel spot has been proposed for the disease.

[**Pear blight studies**] (*Oregon Sta. Bien. Rpt. 1923–24, pp. 91, 92*).—A brief account is given of investigations at the Southern Oregon Substation on blight resistance in pears (E. S. R., 54, p. 252).

As a result of spraying experiments in 1923, it is claimed that the number of infections of blight in orchards was materially reduced by Bordeaux mixture. A test of a proprietary blight remedy proved that the material was worthless under southern Oregon conditions.

Reversion disease of black currants: Means of infection, A. H. Lees (*Ann. Appl. Biol., 12 (1925), No. 2, pp. 199–210, pls. 3, fig. 1*).—This paper, a continuation of work previously noted (E. S. R., 49, p. 649; 51, p. 52) on black currant reversion, deals more particularly with the supposed means of infection. It is claimed that the disease can be spread by contact of diseased with healthy material, as in grafting or pruning with a contaminated tool, and that after the disease enters it is usually propagated slowly but at a rate and with a resulting intensity depending on the intensity of the original infection. Propagation can be independent of the black currant mite, *Eriophyes ribis*. No evidence was obtained of the occurrence of the disease on the ground solely of proximity of diseased to healthy plants. There is, however, evidence supporting the possibility of a pest carrier.

The wither-tip disease of limes, S. P. Wiltshire (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., No. 10 (1925), pp. 401–403, pls. 2*).—Three photographs, credited to J. Jones, illustrate the several types of injury (shoots, leaves, and fruit) caused by lime withertip (*Gloeosporium limetticolum*) on the island of Dominica, which is reported to be suffering from an epidemic as severe as that of the rust (*Hemileia vastatrix*) which is said to have wiped out the coffee-growing industry in Ceylon.

The Holland elm disease [trans. title], A. Brussoff (*Centbl. Bakt. [etc.], 2. Abt., 63 (1925), No. 9–17, pp. 256–267, pl. 1*).—A disease affecting elms for some years in Holland is described in connection with an account of an organism isolated as probably causal and named provisionally *Micrococcus ulmi*.

The nature of decay in wood, B. O. Longyear (*Colorado Sta. Bul. 307 (1926), pp. 58, figs. 29*).—After discussing the causes of decay in wood and the chemical and physical changes induced by the action of bacteria and fungi, the author describes a method of determining the rate and stage of change based on the loss of weight of wood subjected to the influence of decay.

Graphs and other data are given showing the effect of decay on the mechanical properties of samples representing 18 species of soft and hard woods.

Effect of temperature and moisture on nematode root knot, G. H. Godfrey (*Jour. Agr. Research [U. S.], 33 (1926), No. 3, pp. 223–254, figs. 17*).—As a result of his investigations the author found that the effects of soil temperature were evident and conclusive. Below about 16° C. (60.8° F.) the amount of root knot was substantially less than when the temperature was 2 or 3° higher.

At 8° lower it was almost eliminated. At 10 and 12° infections were found to be very rare.

The amount of moisture in reference to root knot was found to play only a small part, so long as the moisture content of the soil was favorable to the growth of the crops. Within the range of from 40 to 80 per cent of the moisture-holding capacity of the soil there was very little difference in root-knot development. Below 40 per cent moisture, which is too dry for a good growth of ordinary crops, and above 80, when the soil is more or less muddy, considerable root knot was found.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Animal ecology, A. S. PEARSE (*New York and London: McGraw-Hill Book Co., 1926, pp. IX+417, fig. 1*).—The several chapters deal with the subject as follows: Introduction (pp. 1–23), physical and chemical ecological factors (pp. 24–63), biological factors (pp. 64–97), succession (pp. 98–131), animals of the ocean (pp. 132–182), fresh-water animals (pp. 183–238), terrestrial animals (pp. 239–277), the relations of animals to plants (pp. 278–295), the relations of animals to color (pp. 296–316), intraspecific relations (pp. 317–345), interspecific relations (pp. 346–370), and the economic relations of ecology (pp. 371–382). A bibliography of 30 pages is included.

Game laws for the season 1926–27, T. DENMEAD and F. L. EARNSHAW (*U. S. Dept. Agr., Farmers' Bul. 1505 (1926), pp. II+46*).—This is the annual summary of the Federal, State, and Provincial game laws and regulations for the year 1926–27 (E. S. R., 54, p. 52).

Rats and how to destroy them, M. HOVELL (*London: John Bale, Sons & Danielsson, 1924, pp. XLII+465, figs. 51*).—This is an extended account of rats, their habits, and indirect loss caused, including the transmission of disease, in which particular attention is given to control measures.

The immediate effects of tobacco smoke on the activity of rats, H. E. FIELD (*Calif. Univ. Pubs. Physiol., 5 (1926), No. 16, pp. 189–194*).—The author found that the experiments conducted showed that the immediate after effect of tobacco smoke on the spontaneous activity of rats is a marked stimulation with the dosages and type of tobacco so far used.

[Helminthological notes], B. SCHWARTZ ET AL. (*Jour. Parasitol., 12 (1925), No. 2, pp. 105–115*).—The notes here presented are based upon reports made at meetings of the Helminthological Society of Washington in 1925.

Notes by M. C. Hall include (1) a report of the wandering habits of *Ascaridia galli* and its occurrence in hen's eggs, and (2) a list of the parasites of the deer, *Odocoileus columbianus*. A note was presented by Christie on the presence of cysts of what is either *Rhabditis coarctata* Leuk. or a very closely related species in over 50 per cent of the imported dung beetles, *Aphodius fimetarius*, collected in the vicinity of Falls Church, Va., during October and November, 1924. The occurrence of *Cysticercus pisiformis* Zeder in the lungs and pericardium and beneath the costal pleura of a Mearns cottontail (*Sylvilagus floridanus mearnsii*) was recorded by M. E. Jewell. Notes on the occurrence of *Metroliasthes lucida* in the chicken, and on the geographical distribution of *Oesophagostomum longicaudum* were presented by B. Schwartz.

Artificial fertilization of aquatic insects, A. H. WIEBE (*Ann. Ent. Soc. Amer., 18 (1925), No. 1, pp. 45–48*).—In work with *Ephemera simulans* Wlk. and *Hexagenia bilineata* Say it was found that artificial fertilization was possible.

Freezing and survival of insects at low temperatures, N. M. Payne (*Quart. Rev. Biol., 1 (1926), No. 2, pp. 270–282*).—This is a discussion of the cause of death from low temperature, in connection with a list of 57 references to the literature.

Some insects and their relation to man, M. A. Reasoner (*Amer. Jour. Pharm., 98 (1926), No. 3, pp. 167–177*).—This is a discussion presented before the Insecticide and Disinfectant Manufacturers Association, at New York City, on December 15, 1925.

Insect toxicology, F. L. Campbell (*Science, 63 (1926), No. 1619, pp. 45, 46*).—The author proposes the term insect toxicology to include the results of all investigations which deal in a quantitative manner with the effects of insecticides on insects.

Insecticidal value of certain war chemicals as tested on the tent caterpillar, F. J. Brinley (*Jour. Agr. Research [U. S.], 33 (1926), No. 2, pp. 177–182*).—This is a report of investigations conducted by the author in 1924, at the Edgewood Arsenal, Md., while detailed by the U. S. D. A. Bureau of Entomology, to study the chemical compounds developed by the Chemical Warfare Service during and since the World War to determine their value as insecticides. In a series of experiments, a number of organic compounds were tested both as stomach poisons and contact insecticides on third-grown to half-grown eastern tent caterpillars. The effect of the insecticide upon the host plant was determined by treating bean plants with the material to be tested.

Most of the compounds that were toxic to insects proved to be so toxic to the plants as to have no practical value. As a stomach poison, diphenylamino arsenious oxide was equal in toxicity to lead arsenate, and it was not injurious to the bean plants. It also has some promise as a contact insecticide.

Fluorides v. fluosilicates as insecticides, R. C. Roark (*Science, 63 (1926), No. 1634, pp. 431, 432*).—A brief review of tests of these insecticides, including a table showing the solubility in water of the more common inorganic fluorides.

Calcium cyanide dust for fumigation of citrus: Experiments to determine dosages, J. M. Arthur and T. H. Harrison (*Agr. Gaz. N. S. Wales, 37 (1926), No. 1, pp. 245–248*).—The data here presented led the authors to conclude that fumigation by the dusting system is attended by far less risk of failure and of damage to the tree than by the use of sodium cyanide and sulfuric acid.

Annual report of the department of zoology and entomology, R. W. Harned (*Mississippi Sta. Rpt. 1925, pp. 26–30*).—This is a brief statement of the progress of investigational work under way. In work with pecan insects the May beetles, phylloxera, pecan weevil, and obscure scale are being given special attention. Reference is made particularly to the gall-forming phylloxera, there being indications that lubricating oil emulsion spray will prove effective against the winter eggs. Life history and control work with crawfish, particularly *Cambarus hagenianus*, which is being conducted by R. N. Lobdell, is referred to. The work with Mississippi scale insects since last reported upon (E. S. R., 55, p. 554) has resulted in the discovery of seven species never previously recorded from the State, namely *Chrysomphalus smilacis* Comst., *Phenacoccus acericola*, *Pulvinaria floccifera* West., *Diaspis echinocacti cacti* Comst., *Chionaspis caryae* Cooley, *Comstockiella sabalis* Comst., and *Pseudophillipia quaintanci* Ckll.

[Report of the department of entomology, Oregon Station] (*Oregon Sta. Bien. Rpt. 1923–24, pp. 74–77*).—In reporting upon the work of the year, reference is made to a shipment of about 1,000 puparia of *Digonochaeta setipennis*

from England during the autumn of 1924, and of *Rhacodineura antiqua* during the spring of 1925, both being tachinid parasites of the earwig.

The peach and prune root borer (*Sanninoidea opalescens*) is said to be easily and cheaply controlled by the use of paradichlorobenzene. When applied in early fall with soil temperatures above 55° F. and soil moisture low, paradichlorobenzene will kill 90 per cent of the borers.

The European earwig was found to be controlled by a poison bran mixture developed by the station, consisting of sodium fluoride 12 oz., molasses 2 qt., wheat bran 12 lbs., and water 6 qt. Reports of this pest by Fulton have been noted (E. S. R., 48, p. 253: 52, p. 253).

Investigations with the onion maggot were undertaken during 1924, as was work with the hop red spider (*Tetranychus telarius*). Notes are also presented on potato insects, insect pests of brambles, an alfalfa weevil survey, the Syneta leaf beetle (*S. albida*), rosy apple aphid (*Anuraphis roseus* Bak.), strawberry root weevils, tent caterpillars, and cranberry insects.

Proceedings of the Entomological Society of British Columbia (*Ent. Soc. Brit. Columbia, Proc. No. 22 (1925), pp. 39, figs. 13*).—Among the papers presented at the twenty-fourth annual meeting of this society, held at Vancouver on February 14, 1925, are the following: Pansy Spots on Apples, by E. P. Venables (pp. 9–12); Lace Bugs of British Columbia, by W. Downes (pp. 12–19); The Lecanium Scale [*L. capreae L.*] Outbreak in Vancouver, B. C., by R. Glendenning (pp. 21–26); The Poplar Sawfly, *Trichiocampus viminalis* (Fallén), by W. Downes (pp. 26–32); The Control of the Oystershell Scale with Oil Sprays, by M. H. Ruhmann (pp. 33–35); Notes on Some British Columbia Grylloblattaria, Dermaptera, and Orthoptera for the Year 1925, by E. R. Buckell (pp. 35, 36); and Additions to the List of Aphididae of British Columbia, by R. Glenndenning (pp. 36–38).

It is pointed out by Venables that certain peculiar yellowish-white blotches with a distinct dark puncture in their centers, which are frequently found upon apples in the northwestern United States and in British Columbia, 15 or more to a single fruit, and are commonly known as pansy spots, are probably caused by *Frankliniella occidentalis* Prg., the most prevalent of several thrips taken from apple bloom. It is said that typical pansy spots also occur upon grapes and tomatoes, the spots being identical in appearance with those found upon apples. Since this thrips has been shown by Seamans (E. S. R., 49, p. 850) to cause heavy losses in those areas of Alberta specializing in alfalfa seed production, the growing of alfalfa as an orchard cover crop in certain sections of the dry belt of British Columbia is thought to have some bearing on the prevalence of pansy spot.

The fact that under the semiarid conditions of the interior of British Columbia the dormant application of lime sulfur is ineffective in the control of the oyster-shell scale led Ruhmann to conduct experiments with (1) Dormoil 10 per cent and (2) fuel oil 10 per cent plus 10 lbs. of whale oil soap to each 100 gal. of spray. Both of these gave excellent control with no apparent injury to the trees.

The tree crickets of Oregon, B. B. Fulton (*Oregon Sta. Bul. 223 (1926), pp. 4–20, figs. 8*).—This paper deals with the economic importance, control, life history, and identification of the three species of tree crickets which occur in Oregon, namely, the snowy tree cricket, prairie tree cricket (*Oecanthus nigricornis argentinus* Sauss.), and western tree cricket (*O. californicus* Sauss.). The prune, apple, peach, loganberry, raspberry, blackberry, and grape are subject to tree cricket injury at times, the injury being due to (1) the habit of feeding on fruits and (2) the egg laying in stems and bark. Egg punctures are sometimes associated with bark diseases. The eggs of tree crickets remain

in the host plants over winter and hatch usually in June. The crickets mature about August 1 and live until heavy frosts kill them.

The snowy tree cricket is the only one of the three which has so far proved to be destructive. It exists as two distinct races identical in appearance but differing in habits, one race living in orchards and the other on berry bushes. The prairie tree cricket lives in treeless areas among tall herbaceous plants, and the western tree cricket on wild shrubs.

Tree crickets are always rare or absent in apple orchards that are regularly sprayed for codling moth. One application of lead arsenate in late June or early July while the crickets are young is usually all that is necessary to control them. On loganberries the pests were controlled by a sweetened arsenical spray.

The occurrence of mites in the tracheal system of certain Orthoptera, L. P. Wehrle and P. S. Welch (*Ann. Ent. Soc. Amer., 18 (1925), No. 1, pp. 35–44*).—The authors report upon studies of a new tarsonemid mite described by H. E. Ewing[3] as *Locustacarus trachealis*, which was found occupying the trachea of adult females of the grasshoppers *Hippiscus apiculatus* (Har.) and *Arphia carinata* Scud. in Kansas. It is said to be the second published record of this unique form of parasitism by a mite, the first being that of *Acarapis woodi* Ren., which causes the Isle of Wight disease in the honey bee. This new mite resembles *A. woodi* in form.

Thysanoptera and the pollination of flowers, P. N. Annand (*Amer. Nat., 60 (1926), No. 667, pp. 177–182*).—The observation by the author of various species of thrips frequenting sugar-beet flowers and moving freely from flower to flower while he was engaged in experimental breeding of sugar beets in Colorado during 1920 and 1921 led to the investigations here reported, which were conducted largely at Stanford University, Calif., but were completed at Fort Collins, Colo. He found that thrips with habits conducive to cross-pollination are able to carry pollen grains of a variety of flowers by flight in quantities sufficient to be of considerable importance in pollination.

"Their ability to carry pollen from anthers to stigma depends on: (1) the size of the pollen grains, (2) the viscosity of the grains, (3) the attractiveness, and (4) the number and species of thrips present. They are capable of bringing about cross-pollination of some species of flowers under field conditions in spite of their well-known tendency to 'blight' flowers by sucking juices from the ovary and by the destruction of other tender parts of the flower, including the destruction of pollen grains. The results obtained emphasize the importance of excluding thrips in breeding experiments where it is desired to prevent cross-pollination."

Contributions to our knowledge of South American Fulgoroidea (Homoptera).—Part I, The family Delphacidae, F. Muir (*Hawaii. Sugar Planters' Sta., Ent. Ser. Bul. 18 (1926), pp. 51, figs. 122*).—The studies here reported are based upon the large collection made by F. X. Williams in South America. The paper deals with 25 genera and 85 species, of which 5 genera are erected and 67 species described as new. Six genera and 29 species described from South America, but unknown to the author and not found among the Williams' material, are also listed, making a total of 31 genera and 114 species known from South America, which number is expected to be greatly increased with further research. It is pointed out that 108 species have been reported from America north of Mexico. Six species are recorded by Williams as feeding on sugar cane and 25 others on various grasses.

The cotton hopper, or so-called "cotton flea," W. D. Hunter (*U. S. Dept. Agr., Dept. Circ. 361 (1926), pp. 15, figs. 4*).—This further account (E. S. R., 52,

[3] Ent. Soc. Wash. Proc., 26 (1924), No. 3, pp. 67, 68.

p. 454), prepared by the late author and revised by J. W. Folsom, deals with the distribution of the small mirid *Psallus seriatus* Reut., its host plants, relation between damage and time of planting, experiments to determine injury to cotton by the hopper, local effects of feeding punctures, dusting experiments, further experiments with insecticides, the effect of sulfur on cotton plants, examinations for a causative organism, and greenhouse experiments.

The preliminary experiments here reported, while not conclusive in showing that the cotton hopper is the cause or the transmitting agent of a disorder of the cotton plant which has occurred in certain localities in southern Texas for a number of years, rather strongly suggest that this insect is the vector of a virus, and two of the cage experiments may constitute definite proof. The disorder is marked by the blasting of the very small squares, an abnormal type of growth, and often the excessive growth of the main stem. It is entirely unlike the several disorders of cotton known as brachysm, tomosis, hybosis, stenosis, and cyrtosis, and distinct from acromania, although showing more points of resemblance to that disorder. No connection whatever has been discovered between the disorder and soil, variety, or cultural or climatic conditions. Practically all of the fields in certain large districts have been affected, sometimes to such an extent that no cotton whatever was picked. In the last few years the disorder appears to have spread to a number of localities in central and northern Texas, and in 1924 for the first time what appears to be the same thing occurred in South Carolina and Georgia.

The circumstantial evidence pointing to the hopper as a carrier is (1) the fact that the disorder appears to be similar to several disorders known to be transmitted by insects, (2) the seasonal history of the insect suggests it as a carrier of the infection, and (3) the disorder begins to appear as soon as the insects migrate to the cotton fields from another plant and subsides noticeably after the insects leave for other plants, the recovery of the cotton plants in some cases being so complete that a very large top crop is produced, sometimes of sufficient weight to bend the abnormally tall plants to the ground. Moreover the hopper is by far the most common insect in the cotton fields at the time the disorder begins. However, the general occurrence of the insect throughout the Cotton Belt, over a large part of which apparently the disorder has never appeared, and the decidedly irregular occurrence of disordered plants in the fields at times, are presented as evidence against such trnsmission.

From horsemint, the first spring host plant found in southern Texas, the cotton hopper migrated to cotton in abundance about the last of April, and early in July there was another migration to several species of the genus Croton, on which it is now known to breed throughout the season.

Sulfur was the most effective material found for destroying the hopper. A recent bulletin on the pest in Texas, by Reinhard (E. S. R., 55, p. 458) has been noted.

The pear psylla and its control, W. A. Ross (*Canada Dept. Agr. Pamphlet 66, n. ser. (1926), pp. 8, figs. 5*).—This is a practical summary of information on *Psyllia pyri* L.

Contributions to the scientific study of the lac industry, I–XI (*Jour. Indian Inst. Sci., 7 (1924), Nos. 7, pp. [2]+97–144, pl. 1; 15, pp. [2]+285–297; 9A (1926), No. 1, pp. 1–24, pls. 10*).—The papers here presented deal with the subject as follows: (1) General Introduction, by G. J. Fowler (pp. 97–103); (2) Problems in Lac Cultivation, by M. Sreenivasaya (pp. 104–113); (3) A Preliminary Note on Pot-Culture Experiments with *Cajanus indicus* as Host-Plant, by M. Sreenivasaya, M. Venugopalan, and C. R. Somayajulu (pp. 114–119; (4) Comparative Chemistry of the Host-Plants of Lac (pp. 120–125) and (5) Rate of Secretion by the Lac Insect (pp. 126–128), both by M. Sreenivasaya;

(6) The Application of Micro-Methods to the Analysis of Lac Products, by C. R. Somayajulu (pp. 129–135); (7) Significance of Sex-Differentiation among Lac Insects, by S. Mahdihassan (pp. 136–141); (8) Some Ether-Soluble Constituents of Lac-Resin, by D. N. Gupta (pp. 142–144); (9) The Influence of Meteorological Conditions on the Life-Cycle of the Mysore Lac Insect, by M. Sreenivasaya and M. Basappa (pp. 285–291), previously noted (E. S. R., 53, p. 858); (10) The Significance of the Constituents of Some Stick-Lacs, by C. R. Somayajulu (pp. 292–297); and (11) Early Recognition of Sex among Lac Insects, by S. Mahdihassan (pp. 1–24).

Plum aphis and brown rot control, A. H. Lees and H. R. Briton-Jones (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt. 1924, pp. 61–65*).—This paper reports briefly upon work with sprays, none of which have completely controlled aphids, brown rot, and caterpillars. The authors consider the most satisfactory method of dealing with the three to consist in the application of a spray (7 per cent Carbo fluid), followed by the application of grease bands to the tree trunks.

Lubricating oil for San Jose scale (*Oregon Sta. Bien. Rpt. 1923–24, p. 93*).—In control work at Talent with lubricating-oil emulsion it was found that both the 2 and the 5 per cent strengths gave perfect results, as no live scales could be found three months after application.

Check list of the diurnal Lepidoptera of boreal America, W. Barnes and F. H. Benjamin (*Bul. South. Calif. Acad. Sci., 25 (1926), No. 1, pp. 3–27*).—In presenting this list of 669 species it is pointed out that many new names have been published and many radical changes in generic names and concepts have resulted from type fixations during the nine years that have elapsed since the publication of any complete list of North Amercian diurnal Lepidoptera.

Silk culture, J. Gebbing (*Seidenraupenzucht. Leipzig: R. Voigtländer, 1925, pp. 164, figs. 78*).—This is a small handbook.

A contribution to the study of the bagworm, Oeceticus kirbyi Guild. [trans. title], F. Lahille and T. Joan (*Min. Agr. [Argentina], Secc. Propaganda e Informes Circ. 583 (1926), pp. 97, pls. 11, figs. 18*).—This is a report of studies of the biology and control of *O. kirbyi* conducted by the authors.

Leaf roller investigations (*Oregon Sta. Bien. Rpt. 1923–24, p. 85*).—Investigations of leaf rollers led to the conclusion that moderate infestations, causing 10 to 15 per cent fruit damage, can be economically handled by double-strength arsenate of lead (4 lbs. to 100 gal. of water), thoroughly applied in the calyx spray. When fruit loss was greater than this, a standard oil emulsion of at least 6 per cent was found effective and is now recommended. The Bordeaux-oil combination also is effective for this pest where equivalent strengths of oil are used.

The mosquitoes of California, S. B. Freeborn (*Calif. Univ. Pubs. Ent., 3 (1926), No. 5, pp. 333–460, figs. 41*).—In this work the author recognizes 31 forms, representing 5 genera, as occurring in California.

[Parasites of Adoretus sinicus], D. T. Fullaway (*Hawaii. Forester and Agr., 22 (1925), No. 4, pp. 115–119*).—This is a somewhat extended report of the findings made during a nine months' trip to the Orient in search of enemies of the so-called Japanese beetle, *A. sinicus*, which has been established in Hawaii for more than a quarter of a century.

Sodium fluosilicate as a control for blister beetles on soybeans in southwestern Louisiana, J. W. Ingram (*Rice Jour., 28 (1925), No. 11, p. 15*).—In control work with the striped blister beetle in 1925 the author found that when sodium fluosilicate was applied at the rate of 15 lbs. per acre of soy beans the majority of the beetles were dead within 24 hours, and it was seldom necessary to dust over 1 acre to cover all the beetles in a field. A mixture of

equal volumes of sodium fluosilicate and hydrated lime gave practically as good results.

Experiments on the control of willow beetles, A. H. Lees (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt. 1924, pp. 120–122*).—The author reports upon preliminary work with nicotine and arsenate sprays and arsenate dusts.

The behavior of the larvae of Cotinus nitida Burmeister (Coleoptera), A. L. Hintze (*Ann. Ent. Soc. Amer., 18 (1925), No. 1, pp. 31–34*).—The author finds the grubs of the green June beetle to feed on root vegetables in the following order: Sweet potato, Irish potato (after the skin is broken), turnip, and carrot.

A new cotton weevil from Peru, H. S. Barber (*Ent. Soc. Wash. Proc., 28 (1926), No. 3, pp. 53, 54, fig. 1*).—Under the name *Eulechriops gossypii* n. sp. the author describes a new zygopid weevil which breeds in cotton, attacking the stem at the surface of the ground. The larvae bore to the center of the stalk, causing the plant to fall over.

Boll weevil in cotton, F. P. Mackie (*Bombay Bact. Lab. Rpt. 1924, pp. 30, 31*).—With a view to combating the probable importation of the boll weevil, investigations were made of the action of hydrocyanic acid gas, using four kinds of Indian weevils, namely Myllocerus, Odoiporus, Polytus, and Calendra.

Relation of the honeybee to fruit pollination in New Jersey, R. Hutson (*New Jersey Stas. Bul. 434 (1926), pp. 3–32, figs. 3*).—A preliminary report of studies conducted by the author since 1922 is here presented under the headings of history, theory and outline of work, efficiency of the honey bee as a pollinizer of fruit bloom in New Jersey, other insects concerned in pollination of fruit bloom, and activity of honey bees in fruit orchards at blooming time and the factors influencing it.

The number of species of insects acting as fruit pollinizers in southern New Jersey was found to be small, and the number of individuals other than honey bees also small, the lack of pollinizers being most serious in apple and pear orchards situated in cultivated areas, less serious adjacent to uncultivated land, and not a problem at all on cranberry bogs, which are surrounded with woodland and bloom two months later than apple and pear. In southern New Jersey honey bees and bumblebees are the most important insect pollinizers. It has been found that honey bees are most advantageously distributed on fruit trees when the hives are placed singly 210 ft. apart each way (one hive to the acre) and about 15 ft. from pollinator bouquets, when used. Weather is a large factor in regulating the flight of bees in the orchards of southern New Jersey, temperature and sunlight being usually satisfactory in the blooming period, but moisture and wind often reducing the flight appreciably.

A list of 127 references to the literature is included.

[Report of the] division of insect and plant disease control, S. B. Fracker (*Wis. Dept. Agr. Bul. 69 (1924), pp. 52–100, figs. 16*).—An account of the work on bee disease control is included in this report.

Some types of parasitism among the Ichneumonidae, R. A. Cushman (*Ent. Soc. Wash. Proc., 28 (1926), No. 2, pp. 29–51, figs. 51*).—Included in this account is a discussion of the forms of external and of internal parasitism.

An earwig parasite (*Oregon Sta. Bien. Rpt. 1923–24, p. 73*).—Reference is made to an active fungus parasite of the earwig, which has been isolated, grown in artificial culture, and made to infect and kill uninjured earwigs.

A new Urosigalphus parasitic on Eulechriops gossypii Barber (Hymenoptera: Braconidae), R. A. Cushman (*Ent. Soc. Wash. Proc., 28 (1926), No. 3, p. 63*).—Under the name *U. eulechriopis* n. sp., the author describes a braconid parasite of *E. gossypii* in Peru.

ANIMAL PRODUCTION

The story of the range, W. C. Barnes (*U. S. Dept. Agr., Forest Serv., 1926, pp. III+60, pls. 11, figs. 7*).—A brief description is given of the occupation of the range by the pioneer stockmen, and the inevitable effect of overgrazing on unrestricted land. An account of the condition of various public domain ranges is presented, in which the effect of unrestricted grazing is particularly evident. The effect of erosion on the denuded lands is likewise important. Conservation and improvement of the ranges through Government control is recommended, the cost to be met from very small grazing fees.

Analyses of commercial feeding stuffs and registrations for 1926, C. S. Cathcart (*New Jersey Stas. Bul. 435 (1926), pp. 5–84*).—The guaranteed and found analyses for protein, fat, and fiber of the commercial feeding stuffs inspected in 1925 are given, including a list of the principal ingredients identified microscopically (E. S. R., 53, p. 666) and a list of registrations for 1926.

[Experiments with beef cattle at the Mississippi Station], G. S. Templeton (*Mississippi Sta. Rpt. 1925, pp. 13–15*).—The results of beef cattle investigations are briefly reported.

Steer feeding.—In continuing the test of the relative economy of adding approximately 2.5 or 5 lbs. of blackstrap molasses to a daily ration of cottonseed meal, corn silage, and Johnson grass hay (E. S. R., 55, p. 562), three lots of ten steers each averaging approximately 850 lbs. in live weight were again fed. The results showed that those receiving the basal ration only made an average daily gain of 2.44 lbs. per head as compared with 2.43 lbs. for those receiving the light molasses supplement, and 2.65 lbs. for those receiving the medium molasses supplement.

Cost of producing cattle in Mississippi.—Data are presented showing the feed consumption and the estimated costs of wintering calves, yearling heifers, 2-year-old heifers, and mature beef cows.

[Experiments with beef cattle at the Nebraska Station] (*Nebraska Sta. Rpt. [1925], pp. 18, 19*).—Investigations with beef cattle have been continued from previous reports (E. S. R., 54, p. 360).

Effect of age and sex upon rate and economy of gain.—Lots of 2-year-old steers, 2-year-old spayed heifers, yearling steers, yearling spayed heifers, and yearling open heifers, and steer, spayed heifer, and open heifer calves have been used in making the comparison of the influence of age and sex upon the rate and economy of gain. All lots were fed for a 175-day period on shelled corn and alfalfa hay. The calves proved to be more efficient in their use of feed than either yearlings or 2-year-olds, but the animals of the last age made the most rapid gains. The steer lots made the most rapid gains in the 2-year-old and in the calf classes, while the open heifers excelled in the rate of gain in the yearling class.

Fattening rations for calves.—Four lots of steer calves were selected for studying the comparative feeding value of shelled corn and alfalfa hay; shelled corn, plus 10 per cent of linseed meal and alfalfa hay; shelled corn, alfalfa hay, and tankage self-fed; and shelled corn limited, silage full-fed, and alfalfa hay self-fed in a 200-day feeding period. The first three rations produced gains of better than 2 lbs. per head daily, while the last ration produced a gain of 1.74 lbs. per head daily. Some variations were observed in the amounts of feed required per unit of gain, but the estimated costs varied between $11.96 per 100 lbs. for the fourth ration and $12.97 for the ration of shelled corn, linseed meal, and alfalfa hay.

Summer feeding of steers.—Dry lot and pasture feeding were compared in a 140-day summer feeding test, using 3 lots of 11 steers each. All received shelled corn, while one lot received alfalfa hay, another Sudan grass pasture, and the third second-year sweet clover pasture. All lots made average daily

gains slightly greater than 3 lbs. per head. Those fed in dry lot were valued at 20 cts. higher per hundredweight than either of the other two groups, though the estimated feed costs were also somewhat higher.

Growing cattle [at the Eastern Oregon Substation] (*Oregon Sta. Bien. Rpt. 1923-24, p. 96*).—The results of two tests indicate that 1 lb. of cottonseed cake furnishes sufficient protein for wintering calves; that 4 to 5 lbs. of alfalfa hay furnish sufficient protein to supplement a straw ration for wintering calves; and that calves and yearlings fed either alfalfa hay or alfalfa hay and silage and given one-half of a full ration have maintained weight and been economical producers.

Finishing baby beef, G. A. Brown and G. A. Branaman (*Michigan Sta. Quart. Bul., 9 (1926), No. 1, pp. 5-8*).—In continuing the comparative study of rations for baby beef (E. S. R., 53, p. 773), three lots of steer calves averaging approximately 410 lbs. in live weight were used for comparing self-feeding with hand-feeding a two-thirds grain ration in a 195-day test. The ration fed to two lots included corn silage, alfalfa hay, and a grain mixture of corn and oats during the first 90 days and corn alone during the balance of the experiment, together with 1 lb. of oil meal per head daily during the first 60 days, 1.5 lbs. during the next 75 days, and 2 lbs. per head daily during the last 60 days. The third lot received no oil meal, but was fed grain equal to that given to the lot hand-fed with oil meal.

The results of the entire experiment showed that the self-fed lot made an average daily gain of 2.44 lbs. per head and consumed an average of 369 lbs. of shelled corn, 72 lbs. of oats, 57 lbs. of linseed oil meal, 406 lbs. of silage, and 77 lbs. of alfalfa hay per 100 lbs. of gain. The lot hand-fed with oil meal made an average daily gain of 2.32 lbs. per head and consumed an average of 266 lbs. of shelled corn, 44 lbs. of oats, 61 lbs. of linseed oil meal, 795 lbs. of silage, and 156 lbs. of alfalfa hay. The third lot hand-fed without oil meal made an average daily gain of 1.92 lbs. and consumed 368 lbs. of shelled corn, 63 lbs. of oats, 598 lbs. of silage, and 194 lbs. of alfalfa hay per 100 lbs. of gain. The comparison of the first two lots indicated that part of the grain may be replaced by silage and alfalfa hay, especially during the first part of the feeding period, and nearly as rapid gains and an equal finish obtained. The poor showing of the third lot which received the most linseed oil meal was a very important feature of the results.

[Experiments with sheep at the Oregon Station] (*Oregon Sta. Bien. Rpt. 1923-24, pp. 30, 96, 97*).—Brief reports are given on the following experiments:

Farm sheep.—Studies have indicated that excessive fat has no detrimental effect upon the breeding efficiency of ewes, but that fattening is usually a result of nonbreeding. In ewes known to be breeders no difference was found between those that were fattened and those kept in a medium or thin condition.

Fattening lambs.—In feeding lambs at Union on rations of peas and barley and barley alone, with and without sunflower silage, all made satisfactory gains, but those receiving the pea and barley mixture made 10 per cent less gain than those on barley alone. All lots received alfalfa hay.

Wintering ewes.—The results of two tests of the value of silage as a supplement to alfalfa hay for wintering ewes before and after lambing indicated that 1 lb. of silage as a supplement to hay was more efficient and less expensive than larger amounts, and saved approximately 0.5 lb. of hay. Silage also had some beneficial effect upon milk production.

Lamb feeding [at the Scottsbluff Substation] (*Nebraska Sta. Rpt. [1925], pp. 35, 36*).—During a 130-day test 13 lots of 25 lambs each were used for testing the comparative feeding value of local available feeds. The smallest gain, averaging 23 lbs. per lamb, was made on a ration of hay and dry beet pulp

containing 15 per cent molasses. The largest gain, averaging 39 lbs. per lamb, was made on corn, cottonseed cake, and beet tops. The largest estimated profit was made on dry beet pulp, cottonseed cake, and hay, and the least on corn, cottonseed cake, and silage.

The salt consumption of sheep: Fattening lambs, J. M. Evvard, L. C. Brown, C. C. Culbertson, and W. E. Hammond (*Iowa Sta. Research Bul. 94 (1926), pp. 129–173, figs. 7*).—Based on the results of 7 winters' lamb-feeding experiments, conducted on 31 different rations and 1,306 lambs, including those noted (E. S. R., 40, p. 874; 49, pp. 571, 870; 55, p. 262), a study has been made of the relation of the ration to salt consumption and the normal salt requirement. Salt was self-fed to all lots. Variations in the average salt consumption in individual lots were as great as from 0.001 to 0.019 lbs. per head daily. These wide variations were evidently related to the components of the ration. Beet molasses tended to cause a very small salt consumption in 3 lots, probably due to its high content of sodium chloride. The salt content of cane molasses was materially less, and the salt consumption was naturally increased when cane molasses replaced beet molasses.

The largest daily consumption of salt was associated with a ration of corn and alfalfa hay. The substitution of corn silage for alfalfa decreased the daily consumption. Soy bean hay, fed either whole or ground, also tended to decrease salt consumption. When cottonseed meal was used as a protein supplement the salt consumption was greater than with linseed oil meal, though this was not in conformity with the relative sodium and chloride contents of the two feeds. The addition of protein supplements to the basal ration tended to decrease the salt consumption. When oats, barley, or corn gluten feed replaced corn the salt consumption was increased.

Studies of the salt consumed by lambs per unit of gain show even greater variation than existed in the salt consumption per head. The amount increased as the feeding period progressed. In comparing lambs with steers, it was found that the steers consumed much less salt per unit of weight, and that the consumption decreased as the feeding period advanced.

The factors probably affecting salt consumption are discussed, from which it appears that the salt consumption probably increases as larger amounts of protein and fiber are consumed, but evidently other factors are also responsible.

Mineral and vitamin requirements of pigs, with special reference to the effect of diet on bone development, G. Bohstedt, W. L. Robison, R. M. Bethke, and B. H. Edgington (*Ohio Sta. Bul. 395 (1926), pp. 59–229, figs. 150*).—This publication gives an account of 8 experiments, conducted over a period of 4 years, dealing with mineral and vitamin requirements of pigs, preliminary results of which have been mainly noted from other sources (E. S. R., 55, p. 162). A total of 452 pigs and 436 rats were used as the experimental animals.

A basal ration of white corn, wheat middlings, linseed meal, and salt was used throughout, since this is a common ration, low in minerals and serving as a satisfactory measure of the value of mineral supplements. The general results indicated that this basal ration was deficient in both vitamins A and D, and in the quantity and quality of the ash. Vitamin B, however, appeared to be present in sufficient amounts for normal development. Supplements of alfalfa to this ration in 3 experiments indicated rather conclusively that proteins and fiber were not important factors in the prevention of the so-called stiffness in swine, which commonly developed with this ration, but that the proteins of the basal ration were not quite adequate for optimal growth.

Histological examinations of the bones of swine with the characteristic stiffness showed abnormal calcification, but the lesions often differed from

those of rickets or osteoporosis. Posterior paralysis occurring on rations low in minerals and vitamins was found to be directly due to fractured vertebrae in the lumbar-sacral region of the spinal column, resulting from poorly calcified bone.

The advantages of adding various supplements to the basal ration for the prevention of stiffness were compared. Additions of ground limestone appeared to be more satisfactory than calcium carbonate, probably due to the presence of impurities which included iron. The consumption of soil and grass by pigs on pasture made for the most rapid gains and best health as judged from external appearances, but the bones of such animals were not as well calcified or as strong as those of pigs which had received ground limestone.

Sunlight also appeared to aid in bone formation. Fractures were common in pigs fed cod-liver oil with the basal ration without calcium supplements, due to the rapid stimulation of growth without proper skeletal development. Bone flour served as a satisfactory mineral supplement in one experiment, but there was evidence of toxicity in two other experiments. Dicalcium phosphate, a component of precipitated bone flour, did not appear to be responsible, and the limited data indicated it to be superior to tricalcium phosphate. Supplements of fish meal and tankage to the basal ration caused fairly rapid growth and good bone, but did not prevent the occurrence of stiffness, probably due to a deficiency of vitamin A in the ration. Commercial blood meal produced large gains during the early part of the feeding period, but frequently hurried the pigs into stiffness and paralysis and caused the production of the poorest bones found in the experiments. Nutritional studies with rats indicated that this product was nearly devoid of vitamins A and B, low in ash, and poor in the quality of its protein, and appeared to have toxic properties. The high temperatures used in the manufacture of the product lowered its digestibility.

Blood analyses of the pigs showed that the blood serum of those receiving alfalfa meal or cod-liver oil had a relatively high inorganic phosphorus content. The best growing pigs also had the highest blood phosphorus content, while the poorest showed low percentages of phosphorus in their blood. Calcium carbonate and ground limestone tended to increase the calcium content of the blood serum, accompanied by a corresponding fall in the phosphorus content. Where such a condition was very marked the pigs suffered from difficult respiration. Supplements of ferric oxide and calcium carbonate increased the hemoglobin content.

These experiments further indicated that the rate of gain was not always correlated with the economy of gain, which is explained as due to the fact that certain deficient rations permit relatively rapid growth and accelerate the time at which a major deficiency will become apparent. The lower economy of gains of fatter pigs may also have been influential in this respect, since the individuals were fed for a definite time rather than to a definite weight.

[Swine feeding experiments at the Mississippi Station], G. S. Templeton and S. W. Greene (*Mississippi Sta. Rpt. 1925, pp. 15, 16, 56*).—The results of three feeding experiments are briefly reported.

Soft pork investigations.—In continuing these investigations (E. S. R., 55, p. 565), two lots of 12 hogs each were grazed on soy bean pasture for 42 days, followed by dry-lot feeding on corn and tankage for 4-, 8-, and 12-week periods. One lot receiving soy beans only during the grazing period made an average gain of 0.86 lb. per head daily, while the other lot which received a 2.5 per cent corn ration made an average daily gain of 1.53 lbs. during the grazing period.

In studies at the Coastal Plains Substation two carloads of hogs were fed on various rations, including peanuts, soy beans, rice polish, and corn. Soy beans

alone proved unsatisfactory, but they were best used as a protein supplement to corn, sweet potatoes, and brewers' rice. Soft pork was produced when rice polish and tankage were fed for a period of 6 weeks, followed by 6 weeks' finishing on corn and tankage. Peanut-fed hogs showed more shrinkage during curing than corn-fed hogs.

Value of molasses supplementing corn and tankage.—Two lots of 20 50-lb. hogs each were fed for 98 days. The results showed that those on the check ration of corn and tankage made an average daily gain of 1.49 lbs. as compared with 1.44 lbs. by those receiving a supplement of molasses hand-fed twice daily at the rate of 0.5 per cent of the live weight of the animals.

[Feeding experiments with swine at the Nebraska Station] (*Nebraska Sta. Rpt. [1925], pp. 20, 21, 33*).—The results of several feeding experiments are briefly reported, some continuations of those previously noted (E. S. R., 54, p. 365).

Summer pig feeding.—Eight lots of pigs averaging 61 lbs. per head were used for comparing dry lot with pasture feeding, alfalfa with Sudan grass pasture, full-feeding with limited grain rations, and the value of tankage with pasture. During the 110-day experiment the pigs receiving corn and tankage self-fed on alfalfa pasture made an average daily gain of 1.35 lbs. as compared with 1.09 lbs., the gain produced by corn and tankage fed in dry lot. Sudan grass compared very favorably with alfalfa, except for its short grazing season. More efficient gains were made on limited grain rations than on liberal grain allowance, but this advantage was offset by an increased forage requirement.

Soy bean meal v. tankage.—In testing the comparative feed value of ground soy beans and tankage as supplements to corn, two lots of pigs were self-fed over a period of 70 days on corn and tankage, and corn, ground soy beans, and bone meal. The two lots made respective gains of 1.43 and 1.07 lbs. per head daily.

Winter feeding.—In a 100-day winter-feeding test self feeders produced an average daily gain of 1.5 lbs., while hand-fed pigs made an average gain of 1.33 lbs. per head daily on the same basal ration. Corn and tankage proved superior to corn and alfalfa for full-feeding pigs, and a combination of these feeds produced slightly larger but more expensive gains than corn and tankage. Limiting these rations tended to produce growth in the pigs rather than fattening.

[*Experiments at the North Platte Substation*].—In a test with 6 lots of 90-lb. pigs, cottonseed meal proved superior to oil meal and equal to tankage as a supplement to corn, but when given free access to corn and cottonseed meal the animals ate 11.3 per cent as much of the latter as of the former. In similar comparisons more cottonseed meal was eaten than tankage.

In another experiment 3 lots of 75-lb. pigs were grazed on Sudan grass pasture, while 3 similar lots were placed on alfalfa. One of the lots on each pasture received corn and tankage self-fed, another corn alone, and the third a 2 per cent corn ration. With the corn and tankage ration the lots of Sudan grass and alfalfa made average daily gains of 1.68 and 1.72 lbs., respectively, requiring 382 and 362 lbs. of grain per 100 lbs. gain. Sudan grass proved inferior to alfalfa when corn alone was fed, the gains of the 2 lots being 1.10 and 1.44 lbs., respectively. Daily gains on Sudan grass and alfalfa with the limited rations were 0.55 and 0.72 lb., respectively.

Lots of 30 72-lb. spring pigs self-fed corn, shorts, and tankage in dry lot for 84 days, and on alfalfa pasture for a similar period, made average daily gains of 1.52 and 1.53 lbs., respectively, in another experiment.

Fattening pigs [at the Eastern Oregon Substation] (*Oregon Sta. Bien. Rpt. 1923–24, p. 97*).—Studies of various pastures have indicated that on the

basis of the grain saved they rank as follows: Peas, barley, winter wheat planted in the spring, peas and oats, kale, and winter rye planted in the spring. Only peas and alfalfa were more economical than the dry lot when the barley was supplemented with tankage.

Ration for work mules, G. S. TEMPLETON (*Mississippi Sta. Rpt. 1925, pp. 12, 13*).—In studying the effect of balanced and unbalanced rations on the condition of work mules and their ability to stand work and heat, 10 teams were divided into 4 groups so that 1 mule of each of 5 teams was in lot 1 and 2, and 1 of each of 5 other teams was in lot 3 and 4. The rations of lot 1 consisted of 10.26 lbs. of ear corn, 3 lbs. of oats, 1 lb. of cottonseed meal, and 15 lbs. of Johnson grass hay per 1,000 lbs. of live weight daily, while lot 2 received 16 lbs. of ear corn and 15 lbs. of Johnson grass hay. Lot 3 received 11.4 lbs. of ear corn, 1.5 lbs. of cottonseed meal, and 10 lbs. of Johnson grass hay, and lot 4 received 13.68 lbs. of ear corn and 12 lbs. of Johnson grass hay. After 5 months' feeding, the rations of lots 1 and 2 and lots 3 and 4 were reversed. The individuals receiving the cottonseed meal maintained a better weight and made larger gains than those receiving the rations of corn and Johnson grass hay only, and there appeared to be no difference in the way the animals withstood heat and work or in their general condition.

[Experiments with poultry at the Mississippi Station], E. P. CLAYTON (*Mississippi Sta. Rpt. 1925, pp. 32, 33*).—Pedigreed pullets were found to lay an average of 10.5 eggs more than nonpedigreed birds in the continuation of the study of the egg-laying powers of pedigreed pullets (E. S. R., 55, p. 568).

The winter and annual egg production of Rhode Island Red and White Leghorn pullets were again found to be closely allied to a certain ratio.

[Experiments with poultry at the Nebraska Station] (*Nebraska Sta. Rpt. [1925], pp. 9, 10, 27*).—The results of experiments are briefly noted.

[*Effect of light and temperature on egg production*].—In continuing this investigation conducted by the department of agricultural engineering (E. S. R., 54, p. 368), four houses have been equipped for studying the effect of minimum temperatures of 40, 50, 60, and 70° F. on egg production. Over a representative period of 2 months the best production was obtained in the house having a minimum temperature of 60°. Three other houses were equipped for studying the effect of heating with a stove, the use of electric lights automatically switched on at 4 a. m., and a house tightly closed from 4 p. m. to 7 a. m. each day. A fourth house was used as a control. Results showed that the highest production was obtained in the pen lighted at 4 a. m.

Turkey production.—In connection with a turkey raising project it has been found that turkey eggs may be successfully hatched in artificial incubators and poults raised in artificial brooders. The young turkeys appear to be even more sensitive to feed deficiencies than young chicks.

The growth of White Plymouth Rock chickens, H. H. MITCHELL, L. E. CARD, and T. S. HAMILTON (*Illinois Sta. Bul. 278 (1926), pp. 69–132, figs. 12*).—The rate of growth in live weight, body measurements, and weights of individual organs and parts of the carcass, as well as changes in the chemical composition of the carcass and gains of a flock of approximately 1,000 White Plymouth Rocks, have been investigated for cockerels and capons ranging in average weight from approximately 0.5 to 7 lbs., and for pullets ranging from 0.5 to 5 lbs. in weight. The biweekly weights showed that the cockerels grew at a distinctly more rapid rate than the pullets, but the capons did not grow at a rate far different from the cockerels up to approximately 6 lbs. The growth rate showed periodical variations, which were considered as related to environmental conditions, particularly weather, rather than as indications of growth cycles.

A study of the relation between 10 body measurements and weight indicated that measurements and weights increased in approximately the same proportion as age, except for the length of the middle toe, showing that the birds did not change materially in conformation during growth. The pullets were in general smaller in external measurement than cockerels except for the length of keel, which was similar in both sexes. There were no distinct differences between the body measurements of capons and cockerels of equal weights.

An account was previously noted of the derivation of the formula for surface area $S=W^{.5}L^{.6}$ (E. S. R., 54, p. 367). This formula was also specifically applied to 5 Rhode Island Red hens, but it was found necessary to change the value of the constant to 5.03 for application to 5 White Leghorn hens. The relative weights of the different parts of the carcasses and empty weights of the birds killed at different ages are given in the following table:

Average weights of parts of carcass of White Plymouth Rock cockerels, pullets, and capons killed at different weights, expressed in percentage of the empty weight

Kind of bird	Approximate slaughter weight	Average age	Average empty weight	"Fill"	Feathers	Blood	Head	Shanks and feet	Heart	Liver	Kidneys	Pancreas
	Pounds	*Days*	*Grams*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Cockerel	0.5	29	216	6.8	4.3	4.2	5.6	5.1	0.80	3.7	------	0.51
Do	1.0	43-57	423	5.8	4.0	4.7	4.5	5.4	.68	3.7	1.1	.42
Do	1.5	71	637	5.3	5.0	4.6	4.2	5.7	.58	3.0	.83	.33
Do	2.0	103	967	2.6	4.8	4.8	3.4	5.8	.48	2.3	.64	.30
Pullet	2.0	73	915	4.8	7.2	3.7	3.1	5.0	.49	2.5	.68	.31
Cockerel	3.0	117	1,305	4.1	6.4	4.1	3.3	6.3	.43	2.3	.60	.22
Pullet	3.0	94	1,293	3.7	8.4	3.2	2.9	4.7	.42	2.2	.63	.22
Capon	3.0	88	1,315	4.4	6.5	4.1	3.0	5.8	.46	2.4	.64	.21
Cockerel	4.0	169	1,725	3.4	7.8	4.2	3.1	5.5	.42	2.1	.50	.21
Pullet	4.0	189	1,787	2.6	8.5	3.3	2.7	3.7	.48	1.7	.55	.24
Capon	4.0	170	1,656	2.7	8.5	4.0	3.1	5.4	.42	2.2	.62	.22
Cockerel	5.0	177	2,156	3.6	8.1	4.4	2.9	5.2	.43	2.0	.53	.23
Pullet	5.0	219	2,245	3.7	7.5	3.5	2.4	3.6	.45	1.9	.62	.22
Capon	5.0	180	2,225	2.6	8.0	4.3	2.6	5.0	.41	2.2	.54	.22
Cockerel	6.0	250	2,509	2.9	8.1	4.2	2.8	4.5	.45	2.0	.52	.18
Capon	6.0	215	2,599	3.5	7.8	3.5	2.3	5.0	.42	1.9	.54	.22
Cockerel	7.0	324	3,182	2.2	5.8	4.7	3.2	4.1	.66	1.3	.39	.17
Capon	7.0	240	3,003	3.0	7.2	3.7	2.3	4.0	.44	2.3	.52	.17

Kind of bird	Spleen	Lungs	Testicles	Digestive tract	Skin	Neck	Legs above hock	Wings	Torso	Total bone in dressed carcass	Total flesh and fat in dressed carcass	Total flesh, fat, and edible viscera [1]
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Cockerel	0.19	0.60	0.05	13.9	6.5	3.7	16.2	6.5	21.3	18.1	25.0	34.5
Do	.21	.58	.04	14.2	7.8	3.5	18.0	6.4	22.5	17.0	31.7	41.1
Do	.27	.52	.03	12.6	7.7	3.3	19.0	6.3	22.4	17.1	33.0	41.5
Do	.20	.43	.03	11.9	7.3	3.9	20.2	6.4	22.0	19.1	33.4	40.7
Pullet	.26	.46	------	11.4	8.0	3.8	18.3	6.2	24.0	17.6	34.0	41.9
Cockerel	.21	.51	.02	10.0	7.0	3.7	21.5	6.7	23.4	18.7	36.1	43.0
Pullet	.23	.51	------	10.1	8.0	3.5	20.0	6.3	26.7	17.3	38.4	45.3
Capon	.21	.52	------	10.0	7.5	3.6	20.3	6.5	25.2	18.1	36.9	44.0
Cockerel	.17	.53	.09	8.6	7.4	3.7	22.1	6.6	24.6	19.1	36.0	42.2
Pullet	.18	.45	------	9.4	9.2	2.9	19.3	5.4	29.3	15.0	41.9	47.0
Capon	.25	.59	------	9.1	8.2	3.5	20.9	6.3	24.5	19.3	38.8	40.4
Cockerel	.19	.55	.06	7.2	8.1	3.4	22.1	5.9	25.0	18.7	36.9	43.3
Pullet	.21	.40	------	8.6	10.0	2.7	19.0	5.4	30.2	14.7	41.8	47.6
Capon	.21	.50	------	8.7	8.6	3.1	21.3	5.9	25.4	17.5	36.6	42.4
Cockerel	.16	.45	.26	7.9	7.6	3.4	22.2	5.9	26.4	16.7	40.2	45.9
Capon	.23	.49	------	9.0	8.8	3.2	20.4	5.7	28.3	17.0	39.3	45.0
Cockerel	.11	.43	1.04	5.8	8.5	3.4	24.9	5.7	26.9	16.0	46.0	50.4
Capon	.21	.42	------	7.5	8.8	2.9	19.7	5.9	31.3	16.1	44.0	49.7

[1] Including heart, liver, gizzard, and kidneys.

Most of the organs and parts of the carcass increased in weight continuously with advancing age, except that the digestive organs reached their maximum size before growth was completed. The offal portion of the carcass, not including the inedible viscera, was approximately 10 per cent of the empty weight at all ages. The percentage of the total dressed carcass increased slightly, but continuously, as empty weight increased, being largely related to the development of the muscular tissue. Differences between cockerels and capons in the weights of the different parts of the body were not so consistent as those between cockerels and pullets.

The changes in the chemical constitutents of the birds associated with advancing age are given in tables and as fitted to parabolic equations of the type $y=ax+bx^2$. Within the three groups pullets fattened distinctly more rapidly than cockerels, while capons occupied an intermediate position. The distribution of nutrients between the three composite samples analyzed, i. e., flesh and edible viscera, bones of the dressed carcass, and offal did not show any progressive changes with advancing age. The flesh and edible viscera contained 35.5 per cent of the total dry matter, 40.8 per cent of the total protein, 30.2 per cent of the total fat, 37.2 per cent of the total gross energy, and 14.7 per cent of the total ash of the entire carcass.

The daily retention of nutrients was calculated for the purpose of this experiment and compared with the White Plymouth Rock chickens which grew more rapidly in experiments at the Indiana Experiment Station (E. S. R., 39, p. 481). From this portion of the study it is concluded that the daily protein retention of cockerels ranges between 2 and 4.5 gm., depending upon the rate of growth. The pullets and capons retained somewhat less protein. The retention of minerals and energy were quite variable at different ages and showed no progressive changes after a weight of 2.5 lbs. was reached. The daily retention of energy was consistently higher for capons than for cockerels or pullets.

Growth of chicks as affected by sunlight thru window glass, thru a glass substitute, and direct sunlight, R. M. Bethke and D. C. Kennard (*Ohio Sta. Bimo. Bul., 11 (1926), No. 4, pp. 131–135, figs. 2*).—In testing the effect of light on growth, three lots of 100 week-old-chicks each were placed in brooders with access to direct sunlight, sunlight through window glass, and sunlight through celo-glass, respectively. All lots received a basal mash of yellow corn, wheat middlings, meat scrap, raw bone meal, common salt, and skim milk. The chicks receiving direct sunlight or sunlight through the celo-glass made normal growth throughout the 10 weeks of the experiment, but severe leg weakness developed at the fifth week in the lot having access only to sunlight through the window glass.

Legume hays instead of green feed for chickens, D. C. Kennard and L. B. Nettleton (*Ohio Sta. Bimo. Bul., 11 (1926), No. 4, pp. 135, 136*).—The results of a preliminary trial have indicated that high quality green leafy alfalfa, red clover, and soy bean hay may be substituted for succulent green feeds during the fall and winter months. The hay may be cut in 0.5-in. lengths, or it may be fed uncut.

The toxicity of salt for chickens, H. H. Mitchell, L. E. Card, and G. G. Carman (*Illinois Sta. Bul. 279 (1926), pp. 133–156, figs. 9*).—In making a determination of the maximum percentage of salt that growing chickens may consume without harmful effects, and in studying the maximum single dose that a chicken may tolerate, 5 lots of 10 8-weeks-old birds, which consisted of 5 White Wyandottes and 5 White Leghorns, were fed at the station poultry plant for 13 weeks, and 5 lots of 5 Rhode Island Reds each of similar age

were fed at the nutrition laboratory for 12 weeks. All lots received well-balanced rations with the following amounts of salt added to the basal ration of both groups: Lot 1, 1 per cent; lot 2, 2 per cent; lot 3, 4 per cent; lot 4, 8 per cent; and lot 5, 1 per cent of salt with free access to rock salt. The results of the feeding showed no apparent detrimental effects on the condition of the birds, though those receiving the 8 per cent ration of salt made slower and less economical gains, probably due to the slow adjustment of the birds to such a salty ration. The average daily intake of salt per kilogram of live weight by all birds of this lot was 6.306 gm., with larger amounts consumed in the earlier weeks of the experiment.

In testing the lethal dose of salt at the conclusion of the above feeding trial, salt in amounts of 2, 4, 6, 8, or 10 gm. dissolved in water was administered twice daily directly into the crop of the individual birds. Two doses of 6 to 10 gm. of salt each were quickly fatal. From 4 to 6 of the 4-gm. doses were required to produce death.

In a further test for determining the comparative effect of fasting with water and of having feed available no significant differences were observed.

The results of the third test, in which doses of 3, 4, or 5 gm. of salt were administered twice daily, indicated that even the 3-gm. dose could not be tolerated for any length of time.

In further tests of the toxic dose per kilogram of live weight, single administrations of 2, 4, and 6 gm. of salt per kilogram of live weight were given. All of the birds getting 6 gm., and one-half of those getting 4 gm. of salt, were dead within 24 hours, while all others survived.

The results of another test indicated that the minimum lethal dose was close to 4 to 5 gm. per kilogram of live weight.

Winter cycle and winter pause in relation to winter and annual egg production, F. A. Hays and R. Sanborn (*Massachusetts Sta. Tech. Bul. 8 (1926), pp. 165–188*).—There are reported in this bulletin the relations of the duration of the winter laying cycle to the winter and annual egg production and other possibly related factors as determined in a study of the egg production of the Rhode Island Red hens hatched in the station flock from 1916 to 1924 (E. S. R., 55, p. 165). The relations are expressed as coefficients of correlation and regression, with a brief discussion of each relationship studied.

The results indicate that the length of the winter laying cycle is unquestionably subject to various environmental influences. The length of the winter cycle evidently is related to both the winter and annual egg production, as the correlation coefficients were 0.6538±0.0085 and 0.4027±0.0156, respectively. The length of the winter pause was also naturally related to winter production, and increases in the length were but partially compensated for by subsequent increases in production. In the birds studied two distinct classes were observed, one of which had a distinct winter pause while the other group showed no winter pause. This indicated that the two groups differed genetically, but it was impossible to differentiate between genetically nonpause birds that showed a winter pause because of environmental influences and birds carrying a dominant factor for this condition.

DAIRY FARMING—DAIRYING

Periodicals relating to dairying received in the U. S. Department of Agriculture, compiled by M. F. Wright (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 16 (1926), pp. 22*).—This mimeographed list consists of three parts, the first giving the name, publisher, place of publication, and brief descriptive notes of the domestic dairy periodicals received at the Library of the U. S. Department of Agriculture, the second giving similar information on

agricultural papers having a section devoted to dairying, and the third part giving the name, publisher, and address of publications issuing current prices of the various dairy products.

[Feeding experiments with dairy cattle at the University of Hawaii] (*Hawaii Univ. Quart. Bul., 4 (1926), No. 4, pp. 19–27*).—The results of two feeding experiments with local products are reported.

The effect of feeding green honohono on the fat content of cow's milk, L. A. Henke and K. N. Hee (pp. 19–24).—This experiment has been carried on to test the theory of local dairymen that the feeding of large quantities of honohono (*Commelina nudiflora*) to dairy cattle tends to lower the fat content of the cows' milk. For this purpose two cows were fed as follows: From June 16 to June 25 on the regular herd ration with other cattle; from June 26 to July 5 on the same ration but confined in a separate paddock; from July 6 to August 4 on the regular ration of concentrates plus approximately 75 lbs. daily of green honohono as the only roughage; and from August 5 to August 23 on the regular ration and with the regular herd. The fat content of the milk for both morning and evening production is tabulated for each day and each animal throughout the test period.

The average results showed that the butterfat content of both cows during the period directly preceding the feeding of the green honohono was 3.59 per cent. During the 30-day experimental feeding period it was 3.50 per cent, and during the following 19-day period with the regular ration it was 3.58 per cent. The difference is considered insignificant.

Pineapple bran as a feed for cows (pp. 24–27).—In continuing the studies of pineapple bran as a feed for dairy cows (E. S. R., 52, p. 376) two lots of four cows were fed on rations containing one-third and two-thirds of pineapple bran in a grain mixture during the entire lactation period, and the results were compared with the two preceding lactations on the regular herd ration.

The average results showed that milk production was considerably better on both of the pineapple bran rations than during the two preceding lactations. The second lactation was also greater than the first, tending to discount somewhat the favorable effect from the pineapple bran feeding. Calculations of the feed required per unit of milk produced indicated that the pineapple bran mixtures were not quite equal to the regular grain ration. It is, however, noted that the cows ate pineapple bran readily without harmful effects, and it is suggested that it appears to be a good feed for dairy cattle.

[Experiments with dairy cattle at the Mississippi Station], J. S. Moore (*Mississippi Sta. Rpt. 1925, pp. 17, 18*).—Data are presented showing the 5-year average grain, hay, and silage consumption per cow per 100 lbs. of milk and per 1 lb. of fat produced by the cows in the entire herd, and by those producing above and below 300 lbs. of fat annually. Preliminary studies of pastures have indicated that good pasture will furnish sufficient feed for a cow to maintain a production of 14 lbs. of milk containing 5 per cent of butterfat.

Tests of the comparative values of soy beans and other home-grown feeds are noted on p. 674.

Ground alfalfa for dairy cows, O. E. Reed and J. E. Burnett (*Michigan Sta. Quart. Bul., 9 (1926), No. 1, pp. 3–5*).—In making a study of the comparative feeding value of ground and unground alfalfa for milk production, two groups of 6 cows each were fed during three 20-day periods, with 10-day transition periods. Both lots received a grain mixture, silage, and alfalfa hay, but the whole and ground hay were fed in alternate periods.

The combined results of the trial showed that there was a net difference of 44.1 lbs. of milk and 2.275 lbs. of butterfat in favor of the ground hay for 6

cows during the 20-day period. With this small difference it is calculated that the grinding of alfalfa hay for dairy cows is neither necessary nor profitable.

Soybeans for dairy cows, J. S. Moore and W. C. Cowsert (*Mississippi Sta. Bul. 235 (1926), pp. 15, figs. 2*).—In a comparison of soy bean, lespedeza, and alfalfa hay, and ground soy beans, soy bean meal, and cottonseed meal for milk production in a ration containing grain and silage and in some cases Johnson grass hay, 8 experiments are reported, the animals being fed in lots of five by the reversal method for 3 periods of 30 days each, the first 10 days of which were considered as a transition period.

In the comparison of soy bean hay and alfalfa hay 16.3 lbs. more milk and 4.18 lbs. less fat were produced with the alfalfa hay than with the soy bean hay. The cows lost a total of 100 lbs. in live weight on the soy beans, but gained 35 lbs. on the alfalfa.

Five cows produced 109 lbs. more milk and 4.51 lbs. more fat on a soy bean hay than with a lespedeza hay ration. They lost 146 lbs. in live weight on the soy bean hay, while they gained 58 lbs. with the lespedeza hay.

In the comparison of lespedeza and alfalfa hay 239.6 lbs. more milk and 6.48 lbs. more fat were produced with the alfalfa. The cows lost 41 lbs. in weight during the alfalfa period and 121 lbs. during the lespedeza feeding.

On a Mammoth Yellow soy bean hay ration 156.7 lbs. more milk and 3.85 lbs. more fat were produced than with Laredo soy bean hay. The weight losses were 124 and 84 lbs., respectively.

On ground soy bean hay 31.4 lbs. more milk and 7.91 lbs. more fat were produced than by lot receiving unground hay, and there was a gain of 243 lbs. in live weight as compared with a loss of 33 lbs.

In two experiments cows receiving cottonseed meal produced 70 lbs. more milk and 9.67 lbs. less fat, and lost 140 lbs. less in live weight than cows fed ground soy beans. In a comparison of soy bean meal and cottonseed meal 138 lbs. more milk and 2.87 lbs. more fat were produced on the latter ration, and when soy bean meal was fed the cows gained 67 lbs. in live weight, while weight was practically maintained with cottonseed meal.

In another experiment cows receiving ground soy beans produced 19.2 lbs. more milk and 5.95 lbs. more fat than when soy bean meal was fed. The loss in weight was 4 lbs. on the former and 52 lbs. on the latter ration.

Soybeans and soybean oilmeal for milk production, C. C. Hayden and A. E. Perkins (*Ohio Sta. Bimo. Bul., 11 (1926), No. 4, pp. 137–141, figs. 2*).—The results of two tests in which the feeding value of linseed oil meal was compared with ground soy beans and soy bean oil meal are reported. Two groups of 4 cows each were fed by the reversal method in the comparison of linseed oil meal with ground soy beans. During the two 7-week test periods the lot receiving the soy bean ration produced 3.6 per cent less milk and 2.7 per cent less fat than those receiving linseed oil meal. The results of the other comparison were previously noted (E. S. R., 55, p. 169). It is concluded from both experiments that ground soy beans or soy bean oil meal may properly replace linseed oil meal in the ration of dairy cattle, provided the prices are comparable.

Feeding the dairy cow, A. C. M'Candlish (*West of Scot. Agr. Col. Bul. 106 (1926), pp. 189–290*).—A practical discussion of the principles of dairy cattle feeding, including tabulations of the digestible nutrients required by cows and the amounts of digestible nutrients in some common feeds.

The apportioning of milk as a basic principle in the milk feeding of calves [trans. title], A. S. Solun (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 2 (1925), No. 12, pp. 786–804, figs. 12*).—Five systems of feeding milk to calves were compared at the Agricultural Academy at Moscow. The systems differed

in the length of the milk feeding period and rate of milk fed, with special reference to the effect of different amounts of milk and the rate of gain at varying periods. The total amount of milk fed per calf was similar in all cases.

The best growth in weight occurred when the milk was given in rather large amounts at the younger ages, with a gradual reduction in the amount of milk as other feeds were being consumed. A reduction in the amount of milk fed to the individuals caused a greater reduction in growth in heifers than in bull calves. The analysis of the results showed that the width of the chest was affected by the amount and intensity of milk feeding, but that other factors, such as internal secretions, likewise influenced growth.

A formula for estimating surface area of dairy cattle, E. C. ELTING (*Jour. Agr. Research [U. S.], 33 (1926), No. 3, pp. 269-279, figs. 4*).—This is a more detailed report of the derivation of the formula for estimating surface area of dairy cattle at the Missouri Experiment Station, which was previously noted (E. S. R., 54, p. 768).

In this study the measurements of the area were determined by the use of a revolving cylinder. The accuracy of this method of measuring was checked by comparison with skin measurements of two slaughtered animals. The formula derived was $SA=1,470\ W^{0.56}$. The live weight and observed and computed surface area of each of the 96 dairy cattle, ranging in age from 10 hours to 10 years, which were used in deriving the formula are presented. The observed and computed areas were compared, as well as areas computed by the formula 839 W 2/3 for surface area. The agreement was decidedly better between the observed area and the area as calculated by the proposed formula. In 92 of the animals the observed and computed areas differed by less than 5 per cent, and the maximum difference was 6.2 per cent in the case of an extremely fat barren cow.

The art of selecting dairy cattle, V. VILLET (*L'Art de Choisir les Vaches Laitières. Paris: S. Bornemann, 1925, new ed., pp. 36, figs. 18*).—Popular directions for judging dairy cattle, with special reference to the importance of the escutcheon.

Holstein cattle in northeast France, E. P. LEBON (*De la Race Bovine Hollandaise dens le Nord-Est de la France. Lille: Camille Robbe, 1925, pp. 128, pls. 2*).—The results of a study of the importance and breeding of Holstein cattle in this region are presented.

A study of fat soluble A as present in the milk of the four dairy breeds (*Nebraska Sta. Rpt. [1925], p. 12*).—The preliminary data so far obtained in this experiment indicated that Jersey milk was richer in vitamin A than Holstein milk, and that Guernsey milk was similarly richer than Ayrshire milk, probably due to the higher fat percentage of Jersey and Guernsey milk. It was also found that milk produced under summer conditions had a higher value for growth promotion than milk produced under winter conditions.

Personal differences in reading Babcock tests on whole milk, F. P. SANMANN and O. R. OVERMAN (*Creamery and Milk Plant Mo., 15 (1926), No. 6, pp. 42, 43*).—A comparison of the individual differences in reading the Babcock test has been made on 21 samples of whole milk which were tested by the Babcock and Roese-Gottlieb tests for butterfat. The Babcock tests were read by 13 different members of the dairy department of the Illinois Station. The readings were made from duplicate tests of each sample and are tabulated in detail for each man.

The result showed that the individual readings varied widely, but that the average for all was only 0.033 per cent higher for the Babcock test than for the Roese-Gottlieb test.

The mycology of milk: A presentation of fermentation phenomena in milk, and the fermentation technique of dairying, H. Weigmann (*Die Pilzkunde der Milch. Eine Darstellung der Gärungserscheinungen in der Milch und der Gärungstechnik des Molkereigewerbes. Berlin: Paul Parey, 1924, 2. ed., rev., pp. VIII+379, pl. 1, figs. 111*).—This is essentially a textbook on dairy bacteriology, being a complete revision of the book previously noted (E. S. R., 25, p. 681). The first portion of the book deals with general types of bacteria and molds found in milk, the second part describes the action of special types, and the third part deals with the rôle of various bacteria in the manufacture and ripening of dairy products.

Milk, cheese, and butter: Statistics of the production in Spain (*Leche, Queso y Manteca: Estadística de la Producción en España. Madrid: Assoc. Gen. Ganaderos, [1925], pp. [123], pls. 19*).—An account of the dairy industry in Spain.

A churn for continuous production ("Butyro" churn) and a butter washer and worker [trans. title], S. Karpinsky (*Bul. Soc. Encour. Indus. Natl. [Paris], 125 (1926), No. 2, pp. 95–100, figs. 5*).—An apparatus for churning cream by pumping it through several chambers is described, as well as equipment for working and washing butter and for holding cream at a constant temperature.

Influence of carbon dioxide upon quality and keeping properties of butter and ice cream, F. F. Sherwood and F. G. Martin (*Iowa Sta. Research Bul. 95 (1926), pp. 179–207*).—This is a detailed account of the experiments designed to study the effect of carbon dioxide treatment during manufacture on the quality, chemical composition, and bacterial content of butter and ice cream, brief results of which were noted (E. S. R., 55, p. 573.)

In making the studies of butter, sweet cream, ripened cream, and sour cream were churned with and without the carbon dioxide atmosphere in different series. The results showed that the carbon dioxide tended to lower the score of the butter, but had no influence on the composition, rate of oxidation, or bacterial content.

The results from the studies with ice cream were likewise negative concerning composition, quality, texture, standing-up quality, and bacterial growth. Tests of the air liberated by butter and ice cream indicated that approximately the same amounts of carbon dioxide were present from the check samples as from those manufactured in a carbon dioxide atmosphere.

Filling up the gaps in freezing data, C. D. Dahle (*Ice Cream Trade Jour., 22 (1926), No. 3, pp. 63–66*).—In experiments at the Pennsylvania Experiment Station the effect of varying amounts of butterfat, milk solids-not-fat, cane sugar, corn sugar, and different flavoring formulas on the freezing point of the ice-cream mix was determined. All samples were frozen with brine at −6° F., but the brine was shut off when the proper whipping consistency was attained. The results tended to show that substances which go into solution in water, such as sugars, lower the freezing point of the mix and increase the time required for freezing. The temperature of the mix was usually at least 2.2° F. below the freezing point when the proper time for shutting off the brine was reached, as determined by the overrun, but the exact difference showed some variability in this respect.

Fancy cheese, W. W. Fisk (*Milwaukee: Olsen Pub. Co., 1925, pp. 80+XVI, pls. 4, figs. 2*).—Practical directions are given for the manufacture of the various types of soft cheese.

VETERINARY MEDICINE

[Report of the department of veterinary medicine, Oregon Station] (*Oregon Sta. Bien. Rpt. 1923–24, pp. 33, 34*).—This report refers briefly to infectious abortion work and miscellaneous studies, including coccidiosis in poultry, gapeworms in pheasants, and lungworms in silver-black foxes.

Under infectious abortion work, it is reported that accurate records were kept of 55 retained fetal membranes that were removed manually. Very satisfactory results were obtained, no deaths having occurred, and over 80 per cent of the cows have bred again. Post-mortem examinations of silver-black foxes from a large fox ranch showed them to be rather heavily infested with lungworms.

Report of the Imperial Institute of Veterinary Research, Muktesar, for the year ending 31st March, 1925, J. T. Edwards (*Imp. Inst. Vet. Research, Muktesar [India], Rpt. 1924–25, pp. 59, pls. 6, figs. 5*).—Details of the work of the year, particularly with rinderpest, are presented, and a summary of the results of inoculations in the field for various diseases is given in tabular form as an appendix.

Administration report of the veterinary surgeon for 1925, G. W. Sturgess (*Ceylon Govt. Vet. Surg. Rpt. 1925, pp. 12*).—An account of the occurrence of infectious diseases of livestock during the year, control work, etc., is included.

Veterinary research report, No. 2, H. R. Seddon (*N. S. Wales Dept. Agr., Sci. Bul. 26 (1926), pp. 48*).—In this second report (E. S. R., 54, p. 71), the Annual Report of the Director of Veterinary Research for the year 1924–25, by H. R. Seddon (pp. 5–11), is followed by papers on Determination of the Presence of *B. botulinus*, Type B, in New South Wales, by H. R. Seddon and H. R. Carne (pp. 12–16); A Note on Spirochaetosis in Fowls, by H. R. Seddon (pp. 17–19); Bacillary White Diarrhoea of Chicks, by H. R. Seddon and H. R. Carne (pp. 20–24); *Further Observations on Stachys arvensis* ("Stagger Weed") as a Cause of Staggers or Shivers in Sheep, by H. R. Seddon, W. L. Hindmarsh, and H. R. Carne (pp. 25–33); Staggers in Stock Due to Rough-Bearded Grass (*Echinopogon ovatus*)—A Preliminary Account (pp. 34–40), Feeding Experiments on Cattle with *Hibbertia volubilis* (F. v. M.) (pp. 41, 42), Feeding Experiments With *Bartsia trixago* (p. 43), *Diplarrhena moraea* Labill.: A Plant Harmful to Stock (pp. 44, 45), and Feeding Experiments with *Cassia sophera* (p. 46), all by H. R. Seddon and H. R. Carne; and Classes for Stock Inspectors, by H. R. Seddon (pp. 47, 48).

Blood fibrin and levulose tolerance in acute and chronic carbon tetrachloride intoxication, P. D. Lamson and R. Wing (*Jour. Pharmacol. and Expt. Ther., 28 (1926), No. 3, pp. 399–408, figs. 2*).—The experiments reported upon have led to the following conclusions:

"A certain threshold dose of carbon tetrachloride by mouth, approximately 0.25 cc. per kilogram, is necessary to produce a fall in blood fibrin. Larger doses (up to 6 cc. per kilogram) cause no greater fall. Maximum oral doses of alcohol alone produce no change in blood fibrin. The simultaneous administration of alcohol and carbon tetrachloride does not reduce the threshold dose necessary to produce a fall in blood fibrin.

"Carbon tetrachloride administered orally in a single dose reduces levulose tolerance, the maximum disturbance occurring about 3 days after administration and normal tolerance being reestablished in 5 or 6 days. A single dose of carbon tetrachloride produces, in 48 hours, a striking derangement of certain liver functions, as shown by an increase in bile pigments in the blood, a reduced tolerance to levulose, a drop in the blood fibrin, and a disturbance of the phenoltetrachlorophthalein liver function test. Dogs chronically poisoned with

large doses (10 to 25 cc.) of carbon tetrachloride given every other day for a period of approximately 4 months and showing tremendous liver lesions of necrosis, scar tissue formation, and all the signs of an early cirrhosis of the liver give normal values for all of these liver function tests. It has been found that under the continued administration of carbon tetrachloride the blood fibrin returns to normal in 2 weeks in spite of the very active liver lesions found.

"Specific threshold oral doses of carbon tetrachloride are necessary to produce a change in the different liver functions examined. These threshold doses for the different functions are approximately 0.25 cc. per kilogram to cause a decrease in blood fibrin, 0.5 to 1.0 cc. per kilogram to cause pathological change, and 4.0 cc. per kilogram to cause a retention of the dye phenoltetrachlorophthalein. Larger doses than this cause no greater disturbance in function in the case of pathological change and blood fibrin."

Experimentally produced late bacteremia and resolving plague in rats, C. L. Williams (*Amer. Jour. Trop. Med., 6 (1926), No. 5, pp. 367–375*).—The author reports that, under the conditions of the experiment here reported, 5.1 per cent of 310 plague-infected rats recovered from the infection and were found to have lesions of resolving plague when killed 21 days after inoculation; 6.8 per cent of 890 plague-infected rats were found to have lesions of resolving plague 30 days after inoculation; and 2 of 39 plague-infected rats were found to have the lesions of resolving plague 46 days after inoculation. Of the resolving cases, 9 killed 21 days, 11 killed 30 days, and 1 killed 46 days after inoculation had plague bacilli in their tissues, as demonstrated by positive results of guinea pig inoculations, while 1 killed 21 days and 4 killed 30 days after inoculation had plague bacilli in blood removed from the heart with a capillary pipette immediately after the rat was killed. The occurrence of plague carriers among rats appears probable.

Experiments on the transmission of rinderpest by means of insects, S. K. Sen (*India Dept. Agr. Mem., Ent. Ser., 9 (1926), No. 5, pp. II+59–185, pl. 1, figs. 6*).—The author reports in detail on transmission experiments by means of *Aedes* (*Stegomyia*) *albopicta* Skuse., the house fly, and the cattle louse (*Linognathus vituli* L.). In work thus far conducted only negative results were obtained under natural conditions.

Host resistance and types of infections in trypanosomiasis and malaria, W. H. Taliaferro (*Quart. Rev. Biol., 1 (1926), No. 2, pp. 246–269, figs. 8*).—The discussion of the subject here presented is accompanied by a list of 54 references to the literature.

An experimental study of the mechanism of regurgitation in rumination, H. D. Bergman and H. H. Dukes (*Jour. Amer. Vet. Med. Assoc., 69 (1926), No. 5, pp. 600–612, figs. 3*).—The authors find that, in regurgitation in the ox, the entrance of food into the esophagus is effected by an aspiratory act of the thorax, the necessary negative pressure in the esophagus being produced by an inspiratory effort with a closed glottis.

"There is no definite bolus formation. A fairly fluid condition of the food material in the anterior part of the rumen is necessary for successful regurgitations, the ingesta entering the esophagus well mixed with fluid. The rumen and the abdominal muscles are not contracting at the moment of regurgitation. The reticulum appears also to be quiescent at the instant of regurgitation, although it appears to contract just preceding and just after the aspiration. The esophageal groove appears to take no active part in regurgitation."

Botulism in cattle from eating rabbit carcases, H. R. Seddon (*Agr. Gaz. N. S. Wales, 37 (1926), No. 7, pp. 522–524*).—Loss of cattle from botulism from this source is reported.

Gastro-intestinal lavage with water at comparatively high temperatures for removing worms from dogs, M. C. Hall and J. E. Shillinger (*Amer. Jour. Trop. Med., 6 (1926), No. 5, pp. 341–346*).—The authors' experiments with water having an initial temperature of 52, 50, and 49° C. in the container and cooling to 47 and 48°, administered in amounts of 4, 3, 2.5, and 2 gal., resulted in the removal of 97.7 per cent of the ascarids, 77 per cent of the hookworms, 51.6 per cent of the tapeworms, and none of the whipworms. The temperatures at which the water was used were too high and resulted in the death of half the animals used, the postmortem picture showing hemorrhagic gastroenteritis and interstinal edema and, in the two dogs dying the day of treatment or the day after, a pulmonary congestion. It is considered possible that water at a lower temperature, such as 45° (113° F.), and in amounts not exceeding 2 gal. would be safe and still show sufficient efficicacy in removing worms to warrant its use in cases where effective anthelmintics were definitely contraindicated, but this possibility should be investigated by critical tests and not assumed to be true, as the available evidence is not sufficient to establish its value or safety.

A note on the similarity between the parasitic forms seen in some cases of avian coccidiosis and blackhead in turkeys, F. W. Schofield (*Ontario Vet. Col. Rpt. 1925, pp. 38, 39*).—The author's observations show that the fowl is susceptible to an amebic enterohepatitis, as has been previously reported by other investigators, and that coccidial and amebic infections are very apt to be confused clinically. It is pointed out that a microscopic examination of the feces will usually reveal the presence of coccidia if these are present in sufficient numbers to cause disease. The amebas are not so readily recognized or identified.

The method of transmission of avian typhoid, T. M. Doyle (*Jour. Compar. Path. and Ther., 39 (1926), No. 2, pp. 137–140*).—The author points out that in Great Britain avian typhoid, due to *Bacterium gallinarum*, is enzootic in Wales and the bordering counties, and, while poultry farming is not carried on extensively in those parts, the disease causes a heavy annual loss among the flocks kept on the general farms. He calls attention to the fact that Taylor (E. S. R., 35, p. 283) and Beaudette (E. S. R., 54, p. 579) report a loss among young stock to have been caused by this organism in the United States, although Rettger has never observed a natural outbreak among young chicks. It is stated that there is no record of the occurrence of the disease in chicks in Great Britain.

Since bacteriological examination has been made of many hundreds of chicks received from all parts of Great Britain, he considers it extremely improbable that if *B. gallinarum* caused serious epidemics it would have escaped detection. Fermentation reactions are always included in the routine examinations, and it is considered equally improbable that the organism could have been confused with *B. pullorum*. It is stated that, while the isolation of *B. gallinarum* from the ovaries of carrier hens and from the organs of young chicks points to the possibilities of transmission through the egg, this has not yet been proved, and that the clinical history of outbreaks in Great Britain at least is strong evidence against it. It is considered reasonable to assume that, if *B. gallinarum* were transmitted through the egg in the same way as *B. pullorum*, there would be a heavy mortality among the chicks raised on farms where the disease is enzootic.

Bacteriological examinations were made of 80 eggs from 9 reactors which laid 150 eggs over a period of 9 months, employing the same technique as for the isolation of *B. pullorum*, but in every case with negative results. Sixty eggs were incubated and 45 normal chicks were hatched, all of which remained healthy up to a month of age, when the observations were discontinued. Cul-

tures made from infertile eggs were found to be sterile. At the close of the laying period the 9 reacting fowls were killed, and bacteriological examinations of the organs showed the ovaries of 5 to contain *B. gallinarum*, and in 4 of these pathological changes were found. The lesions were indistinguishable from those produced by *B. pullorum*.

Infectious bronchitis of fowls, J. R. Beach (*Jour. Amer. Vet. Med. Assoc., 68 (1926), No. 5, pp. 570–580, figs. 2*).—This is a contribution from the California Experiment Station summarizing the present status of knowledge of this disease and means of control.

Chilomastix gallinarum, morphology, division, and cultivation, W. C. Boeck and M. Tanabe (*Amer. Jour. Hyg., 6 (1926), No. 3, pp. 319–336, pls. 2, fig. 1*).—This is a report of studies of a flagellate parasitic in the ceca of turkeys and chickens, first described in 1911 (E. S. R., 25, p. 789). The authors find that it is readily transferred from one bird to another by the ingestion of material containing the motile or encysted organisms.

Some notes on Salmonella pullora infection, R. Gwatkin (*Ontario Vet. Col. Rpt. 1925, pp. 44–64, figs. 2*).—Studies conducted during the spring of 1925 (E. S. R., 53, p. 278) are reported under the headings: Technique of agglutination test, comparison of dilutions, comparison of readings at 24 and 48 hours at 37° C. and at room temperature and 37°, rapid agglutination method (macroscopic), comparison of strains of *S. pullora* for antigen, persistence of agglutinins in carriers, examination of eggs from infected hens, infection in adult birds, examination of males giving positive agglutination reactions, bacteriological examination of ovaries from positive and suspicious hens, and the liver in normal chicks.

A dilution of 1 to 50 was the most satisfactory of those tried in the agglutination test, provided that any degree of agglutination in that dilution was regarded as positive and that only sera in good condition were used. A higher dilution did not appear to be of value except in the case of hemolyzed samples, which in any event should not be tested. The indications were that the ovaries of birds whose blood agglutinated in a dilution of 1 to 10 only were not infected. Incubation for 24 hours at 37° C. or for 48 hours at room temperature was sufficient for routine agglutination tests, although in doubtful cases an extra day was valuable. The rapid macroscopic agglutination method, which had been successfully applied to samples of cattle blood in infectious abortion was of no value in the detection of *S. pullora* carriers.

One of 6 strains of *S. pullora* examined was unsuitable for an agglutination antigen, showing slight or no agglutination with 10 positive sera, and indicating that there might be a good deal of variation in the agglutinability of typical cultures and the necessity for picking suitable ones for the preparation of antigen. Variability in gas production was observed in the examination of these cultures. The blood of 11 birds with infected ovaries showed agglutination constantly, though in varying degree, throughout the period of test, from April until October, or until they died. Agglutination results gave no indication of being influenced by laying, broodiness, or molting. The ovary of 1 bird whose blood varied from positive to negative was examined, and *S. pullora* was not recovered.

Examination of 452 eggs from 11 infected hens showed only 4.76 per cent to be infected with *S. pullora*. None of a second batch of 32 eggs examined by more ellaborate technique were infected, showing that only a small number of eggs from infected hens might be infected. Five mature male and female birds were fed fresh cultures of *S. pullora*, but the organism could not be recovered from the organs upon examination 37, 30, 52, 21, and 12 days after

feeding. Four of 5 developed agglutinins in their blood. Examination of the organs of 4 male birds whose blood agglutinated *S. pullora* failed to reveal the presence of the organism. *S. pullora* was recovered from the ovaries of 94 of 102 birds whose blood gave a positive agglutination reaction. It could not be recovered from 5, and 3 cultures were overgrown with spore-forming bacteria, preventing an examination. The liver in normal chicks was observed to be yellow for the first week and to become quite brown by the end of the second week. The yolk had practically disappeared by that time.

AGRICULTURAL ENGINEERING

Duty-of-water experiments [at the Harney Valley Substation] (*Oregon Sta. Bien. Rpt. 1923–24, p. 81*).—Duty of water experiments are reported to have indicated the best results from 12 to 14 acre-in. per season for cereals, 18 to 20 for alfalfa, 18 for clover, 30 for Mammoth Russian sunflowers, 14 to 16 for field peas, 18 for peas and oats, 10 for potatoes, and 12 acre-in. for beets and mangels.

Drought, its prevention and cure (*Met. Mag. [London], 60 (1925), No. 719, pp. 262–265; Nature [London], 117 (1926), No. 2935, pp. 168, 169*).—An article on The Kalahari Project, by Schwarz, is briefly reviewed, attention being called especially to the progressive drying up of large areas originally extensive lakes in Africa. The view is expressed that "the disappearance of the Kalahari lakes is part of some more general change, on so vast a scale that human endeavor can perhaps palliate but can not hope to reverse it."

Irrigation methods (*Oregon Sta. Bien. Rpt. 1923–24, p. 82*).—In discussing studies at the Umatilla Substation it is reported that tests on the proper size of borders show that they should be constructed 30 to 40 ft. wide and 150 to 200 ft. long, depending upon the size of the head of water available, the character of the soil, and the topography of the land. Tests to determine the economical application of water to sandy soil types without loss from percolation showed that the coarser types should not be irrigated with over 3 in. of water, the medium types with 4 in., and the finer types with 5 in. per application.

Triennial review of irrigation in India, 1921–1924 (*India Dept. Indus. and Labor, Pub. Works Branch, Irrig. India, Trien. Rev. 1921–1924, pp. 43*).—The progress of irrigation in various provinces of India during the period is reviewed, and statements showing the financial results of productive and unproductive irrigation and drainage works for the period are also included.

Equipment for excavating marl, H. H. Musselman (*Michigan Sta. Quart. Bul., 9 (1926), No. 1, pp. 17–21, figs. 3*).—A brief description is given of a mobile outfit for excavating marl, developed at the station, which is said to be in use for the third season with considerable success.

Relation of the manner of failure to the structure of wood under compression parallel to the grain, J. L. Bienfait (*Jour. Agr. Research [U. S.], 33 (1926), No. 2, pp. 183–194, figs. 6*).—Studies conducted by the U. S. D. A. Forest Service are reported which showed that slip lines, or slip planes, are the first indication of injury in compression parallel to the grain, but that it is doubtful whether they are likewise produced in tension along the grain.

The early or initial failures, consisting principally of numerous localized slip planes, show no such distinctive difference between their radial and tangential aspects as that exhibited by gross failures. Apparently, however, they are sources of zones of weakness within which the buckling of the fibers resulting in gross failures may start more easily than elsewhere.

The gross failure in compression parallel to the grain consists of a buckling of the fibers. The least amount of friction between fibers occurs when the plane of buckling or failure is inclined. The inclination of the failure occurs as a rule in a tangential direction. The only probable explanation of this behavior is that the medullary rays increase the resistance to buckling in a radial direction, thus causing the line of failure to be inclined on the tangential surface.

The significance of the common test methods for determining the strength of mortars, J. W. GOWEN and H. W. LEAVITT (*Amer. Soc. Testing Materials Proc., 25 (1925), pt. 2, pp. 218–227, figs. 6*).—Studies conducted by the Maine Experiment Station and the Maine State Highway Commission are reported.

It is concluded that the standard tension test, the standard compression test, and the new abrasion test upon sand mortars give quantitative measures of important stresses to which a mortar is subject in many concrete structures. Each of these tests gives concordant results when check tests are performed upon the same materials. It is further concluded that each of these tests should be performed upon all sands to be used in Portland cement concrete.

A study of temperatures in high-alumina cement and methods of curing, H. S. MATTIMORE (*Amer. Soc. Testing Materials Proc., 25 (1925), pt. 2, pp. 192–197, figs. 2*).—Studies conducted by the Pennsylvania State Highway Department are reported which showed that high-alumina cement has compressive and transverse strengths at 24 hours greater than those of Portland cement concrete at 28 days. Wet burlap curing, effective for Portland cement concrete, was found to increase the temperature during hydration and to produce a defective surface when used with high-alumina cement concrete.

Application of moisture at too early stages either by sprinkling, ponding, or covering with wet burlap produced a dusty or scaled surface. It is concluded that water curing should be started when hydration is well under way, as indicated by a rise in temperature. This can be detected by a stiffening of the surface and a drying-out appearance. Under laboratory humidity and temperature conditions the safe period was found to be 7 hours after mixing. Storage or air curing in bags reduced the high temperature during hydration and also delayed hydration. After 4 months' storage in bags the hydration was delayed about 2 hours.

The use of sulfur in rendering cement drain tile resistant to the attack of alkali, P. H. BATES (*Indus. and Engin. Chem., 18 (1926), No. 3, pp. 309, 310*).—Studies conducted at the U. S. Bureau of Standards are reported which showed that although the treatment of cement products such as draintile by impregnation with molten sulfur increases their strength very markedly and decreases their absorption, it does not in any manner increase their life in alkali soils.

Brick making on the farm, A. C. JENNINGS (*Rhodesia Agr. Jour., 23 (1926), No. 1, pp. 21–28, pl. 1, figs. 2*).—Methods and apparatus used in the manufacture of bricks on Rhodesian farms are described.

Tentative methods of testing smooth-surfaced asphalt roll-roofing, slate-surfaced asphalt roll-roofing, and slate-surfaced asphalt shingles (*Amer. Soc. Testing Materials Proc., 25 (1925), pt. 1, pp. 792–796*).—These methods cover the examination of roofings and shingles composed of roofing felt, saturated and coated on both sides with asphalt, and surfaced on the top with either powdered or granulated mineral matter and on the underside with powdered mineral matter.

Tentative methods of testing felted and woven fabrics saturated with bituminous substances for use in waterproofing and roofing (*Amer. Soc. Testing Materials Proc., 25 (1925), pt. 1, pp. 776–785, fig. 1*).—These methods cover the examination of felted or woven fabrics saturated, but not coated, with asphalt or coal-tar products, for use in the membrane system of waterproofing and roofing.

Report of a survey of transportation on the State highway system of Connecticut (*U. S. Dept. Agr., Bur. Pub. Roads, 1926, pp. 101, pls. 4, figs. 51*).—The results of a survey of transportation on the roads of the State of Connecticut made by the Bureau of Public Roads in cooperation with the Connecticut State Highway Department are presented in detail in this report.

Handbook on construction and maintenance of the national forests' telephone system (*U. S. Dept. Agr., Forest Serv., 1925, pp. V+126, figs. 93*).—The purposes of this handbook are (1) to set forth certain broad policies, (2) to describe certain approved types of telephone construction and maintenance (including installation of instruments) and to establish standard specifications for the more important types, (3) to explain briefly the fundamental principles involved in the operation of telephone lines and instruments, (4) to furnish instructions for locating and clearing trouble, and (5) to describe special methods used and practices followed in different districts which are adaptable to the varying field conditions.

Drying apparatus for grass seed [trans. title], W. FISCHER (*Grünland, 44 (1926), No. 2, pp. 22–26, fig. 1*).—An apparatus for the drying of grass seed is described and illustrated. It has been found that grass seed containing more than 20 per cent of moisture is likely to take on a bad color and to fail to develop a normal germination power. The drying system employs air heated to aronnd 40° C. (104° F.). This reaches from 50 to 60° in the drying cells, and is cooled to from 20 to 25° through the moisture evaporation at the point of exit. The seed is subjected to the current of warm air only about 1.5 minutes and must be cooled before sacking.

Fire curing tobacco barns (*Rhodesia Agr. Jour., 23 (1926), No. 1, pp. 33–36, pl. 1*).—Drawings, specifications, and a bill of materials for fire curing tobacco barns for use under Rhodesian conditions are presented.

The permanent hog house, H. M. WARD (*Building Age, 48 (1926), No. 3, pp. 118, 119, figs. 5*).—Drawings showing structural details and a table of quantities of materials for permanent hog houses are presented.

The construction of a laying house for poultry (*North. Ireland Min. Agr. Leaflet 28 (1926), pp. 6, pl. 1*).—Information, drawings, and a bill of material for use in the construction of a laying house for poultry to meet conditions in Northern Ireland are presented.

The disposal of dairy wastes, L. C. BURROUGHS (*Jour. Dairy Sci., 7 (1924), No. 5, pp. 503–523, fig. 1*).—Studies conducted by the Maryland State Department of Health are reported which showed that flocculation and sedimentation of the casein in milk wastes is satisfactory within the pH limits of 4.5 and 4.9. The supernatant liquid resulting from waste so treated has a high relative stability number. It was found that after detaining the treated waste in tanks until good sedimentation has occurred the supernatant liquid can be discharged into a small stream or ditch without causing a nuisance.

Observations on the Michigan septic tank, O. E. ROBEY (*Michigan Sta. Quart. Bul., 9 (1926), No. 1, p. 22*).—A brief report of an examination of a tank in operation since 1915 and one in operation since 1918 is presented. The results indicate that a septic tank will work satisfactorily when near the surface, and that the tile system may be shallow even under somewhat adverse conditions.

The utilization of solar light and heat in the treatment of night soil, M. E. BARNES (*Amer. Jour. Hyg., 5 (1925), No. 2, pp. 202–216*).—Studies on the possibility of utilizing solar light and heat for the purification of night soil are reported. These showed that insulated boxes provided with tight fitting, double-layered glass covers are an effective means of concentrating heat derived from the sun under conditions prevailing in Siam. It was found that the temperatures attained within such boxes under favorable conditions greatly exceeded the thermal death points of the ova and larvae of hookworms, and that the maximum temperatures obtained exceeded the thermal death points of all vegetative forms of ordinary bacteria. The utilization of solar light and heat by means of such boxes for the treatment of night soil in selected regions is therefore suggested.

RURAL ECONOMICS AND SOCIOLOGY

German approach to farm economic investigations, I. FAUSER (*Jour. Farm Econ., 8 (1926), No. 3, pp. 289–297*).—This paper, read at the sixteenth annual meeting of the American Farm Economic Association in December, 1925, gives a brief description of the system and method of F. Aereboe as adopted by most of the farm economists of Germany. The Aeroboe method is primarily deductive, with the deductions verified by facts from actual life. His studies of types of farming, farm organizations, and individual enterprises are made with the view of showing for what reasons farming is carried on in one way and not in another rather than to learn how it is carried on. The mutual relations between individual enterprises, the adjustment of enterprises to natural and economic conditions, the personality of the individual farmer, and the problems growing out of the economic conditions on the individual farms are stressed in his studies.

[Rural economics investigations at the Ohio Station], J. I. FALCONER (*Ohio Sta. Bimo. Bul., 11 (1926), No. 4, pp. 155–159*).—Results of work in rural economics are given.

Corn and hog ratio in Ohio.—The monthly corn and hog ratio is tabulated from January, 1911, to April, 1926, inclusive. The average was 1:11.5, and the period between one wide margin to another four to six years.

Comparative prices of Ohio farm products.—The index numbers of 17 Ohio farms products are tabulated for April and May, 1926, and for the years 1921 to 1925, inclusive.

Index numbers of production, wages, and prices.—The index numbers previously noted (E. S. R., 55, p. 482) are continued through April, 1926.

Soil type as a factor in farm economy.—I, The town of Lebanon, L. G. DAVIS and C. I. HENDRICKSON (*Connecticut Storrs Sta. Bul. 139 (1926), pp. 51–95, figs. 22*).—The results are embodied of an economic field study made in the summer and fall of 1923 in conjunction with a detailed soil and land cover survey. The relation of soil type and other physical characteristics to the acreage and yield of crops; the productivity of livestock; the size, character, organization, and profitableness of farms; the character of the population; and the trends of agricultural development are considered for 180 farms located in areas the predominating soils of which are either Charlton loam or similar soils, or Gloncester fine sandy loam or similar soils. These two types of soil differ chiefly in water-holding capacity, the Charlton soils being fairly retentive and the Gloucester soils somewhat leachy.

The study brings out that a much larger proportion of the Charlton soil area is utilized for crops. The average labor income is distinctly higher, the soil productivity about 4 per cent superior, and the milk production per cow approxi-

mately 25 per cent—nearly 1,000 lbs. per cow—greater on the Charlton than on the Gloucester areas. Regardless of the soil the total receipts, crop acres, and cattle and animal units per farm are more than 30 per cent higher and the use of labor about 25 per cent more efficient on the farms of native-born farmers, due largely to the farms of foreign-born farmers being markedly smaller. Land values and tax levies are out of line with the agricultural earning power of the different types of land.

Variations among Indiana counties in land values and roads, S. S. VISHER (*Ind. Acad. Sci. Proc., 40 (1924), pp. 143–146, figs. 4*).—This is a study by means of four maps of counties of the relation between land values, assessed valuations of land and lots, and the mileage of surfaced roads. The mileage of roads in different counties per 100 square miles was found to vary largely with the wealth and topography of the county and the supply of road-making materials easily available. It is shown that taxpayers in poorer counties often pay a larger portion of their taxes for roads than do those in richer more level counties.

State policies in agricultural settlement, B. HENDERSON (*Jour. Land and Pub. Utility Econ., 2 (1926), No. 3, pp. 284–296*).—While there was a marked decrease from 1920 to 1925 in the number of farms and the acreage in farms in the United States, in 26 States the number of farms increased and in 5 States there was an increase of 18,000,000 acres in the land in farms. It is estimated that in 1924 2,000,000 persons moved from farms to towns or cities, yet over 1,400,000 moved from cities and towns to the farms.

The present and past policies of the several States as to agricultural settlements are discussed in this article under three general groups: Those encouraging settlers through direct loans or by facilitating financing of land purchases, irrigation districts, etc.; those protecting settlers through certification of lands, real estate licensing laws, control over sales, etc.; and those controlling expansion through State-controlled group settlements, State-directed individual settlements, and land economic surveys.

The future will probably demand the development by the Federal Government and the States of policies that will regulate and control the reclamation and the expansion of the agricultural area, the distribution of settlers in selected regions under conditions that offer reasonable social and economic opportunities and do not threaten the economic adjustment of agriculture and other industries, and which will make adequate provision for forest production, crop production, grazing, protection of game and fish, recreational facilities, drainage, power, etc.

Crops and Markets, [August, 1926] (*U. S. Dept. Agr., Crops and Markets, 6 (1926), Nos. 6, pp. 81–96; 7, pp. 97–112; 8, pp. 113–128; 9, pp. 129–144*).—The usual market information, tabulations, notes, and summaries are given.

Monthly Supplement to Crops and Markets, [August, 1926] (*U. S. Dept. Agr., Crops and Markets, 3 (1926), Sup. 8, pp. 233–272, figs. 3*).—The usual tables, charts, comments, and summaries are included for the cold-storage holdings August 1; supply, distribution, and consumption of cotton; the acreage, condition, and production of the more important crops; milk and other dairy products; carload shipments of fruits and vegetables; exports of grains; livestock and livestock products; estimated prices of farm products, July 15; the price situation; world agriculture, etc. Special reports are included on the acreage and condition of cotton, July 16 and August 1; the intentions to sow winter wheat and rye; the outlook for tobacco production on August 1; the wool shorn, 1925 and 1926; the acreage, condition, and yield of specified truck crops for manufacture; the lamb survey, July, 1926; the sheep and wool outlook; dairy products manufactured in 1925 by months and by States; and

the monthly weighted prices of grains from January to June, 1926, with comparisons of crop year averages, 1923–24 to 1925–26.

Cold-storage holdings (*U. S. Dept. Agr., Statis. Bul. 13 (1926), pp. 32, fig. 1*).—The statistics on cold storage warehouse space and cold storage holdings of apples, dairy products, eggs, meats, lard, dressed poultry, and fish given in a previous bulletin (E. S. R., 52, p. 693) are brought down to October 1 and December, 1925, respectively.

Fluctuations in wheat futures (*U. S. Senate, 69. Cong., 1. Sess., Doc. 135 (1926), pp. XI+122, figs. 23*).—This is a report by the Grain Futures Administration, U. S. D. A., on the special investigation made to ascertain the character of the operations in wheat futures and to what extent such operations were responsible for the erratic and extreme fluctuations in the price of wheat futures during the early months of 1925. The 89 trading days from January 2 to April 18, 1925, were chosen for detail study. During this period the price of May wheat on the Chicago Board of Trade advanced nearly 30 cts. per bushel during January, and later declined 65.5 cts. per bushel from March 2 to April 3.

Measures of agricultural purchasing power, L. H. BEAN (*Jour. Farm Econ., 8 (1926), No. 3, pp. 361–375, figs. 3*).—This paper, read at the sixteenth annual meeting of the American Farm Economic Association in December, 1925, discusses the three forms of agricultural purchasing power—the purchasing power of the farmer's dollar, the purchasing power of the farmer's product, and the purchasing power of the farmer, or the farmer's income—and indicates briefly the practical significance of the purchasing power of the farmer's income as a measure of agricultural welfare and as an element in the business activity of the country as a whole. A dicussion by L. M. Graves brings out the need of research to devise measures of the actual utilization of purchasing power, since the qualitative distribution is affected by such factors as varying capital requirements on farms, changing standards of living, changing levels of income, static variations in per capita income, racial traits, long time trends in per capita income, variation of rates of increase of income per farm in different sections, etc., and the quantitative distribution by conditions maintaining in previous years, the prospects for the following year, and the farmer's mental attitude as affected by crop prospects, real or fancied grievances, lag in land values, etc.

Index numbers of the prices of farm products, C. F. CLAYTON (*Jour. Farm Econ., 8 (1926), No. 3, pp. 347–360*).—This paper, read at the sixteenth annual meeting of the American Farm Economic Association in December, 1925, gives a brief summary of the index numbers of farm product prices used by the U. S. Department of Agriculture in the past, of the new index of farm prices of the Bureau of Agricultural Economics, U. S. D. A., and of index numbers constructed and used by various States. The value, purpose, suggested limitations on usefulness, and significance, etc., of State index numbers are enumerated and discussed by the author and by M. R. Benedict and F. P. Weaver.

The development of a basic purchasing power index by counties, H. G. WEAVER (*Jour. Farm Econ., 8 (1926), No. 3, pp. 376–395*).—A description, together with a discussion of the defects and limitations, is given of a process of computing formulas for determining the purchasing power indexes by counties. These indexes are based on the total value of the products of the county, the total retail outlets, the total population, and the total number of income tax returns.

Index number of Iowa farm products prices, K. BJORKA (*Iowa Sta. Cur. Econ. Ser. Rpt. 3 (1926), pp. 16, figs. 4*).—Description is given of the method used in constructing monthly and annual index numbers based on the prices

of hogs, cattle, sheep, corn, oats, wheat, hay, butter, eggs, and poultry, using the period 1910–1914 as the base.

Tables and graphs are included showing the monthly and annual index numbers of farm products, the monthly and weighted annual farm prices, and the monthly and annual price relatives of the included products from January, 1910, through April, 1926.

The bumper corn crop surplus, G. S. SHEPHERD (*Iowa Sta. Cur. Econ. Ser. Rpt. 4* (1926), pp. 3–23, figs. 15).—A study is made of the factors determining the fluctuations of the average price of corn, the costs of carrying over the surplus of a greater than normal corn crop, and the probable profits of so doing. Graphs and tables are included showing the relative changes in the United States feeds (corn and oats) production and the yearly price of No. 3 yellow corn at Chicago from 1899 to 1925, the monthly shrinkage of corn in storage, the price rises necessary to cover the costs of storage, and comparing the monthly Chicago prices of corn for 25 months and the calculated costs of storage for 21 months following November of each of the 12 years from 1899 to 1923 in which the corn crop was normal or greater than normal.

The average price of corn through the year appears to be determined to the extent of 82 per cent by the size of the United States corn crop plus the carryover on farms on November 1 and 87 per cent by the feeds production (corn and oats production plus carryover). The barley and wheat production add about 1 per cent each to the above, and the hog production exercises about the same influence as the oats production. The yearly fluctuations in the feeds crop causes fluctuations about one and one-half times as great in the opposite direction in the average price of corn.

The study brings out that (1) normally corn stored from the greater than normal crops should be held from 18 to 21 months, (2) if the corn crop following a big feeds crop is very short the sale should be made in the late winter or early spring of the second year, (3) in case of several big feeds crops in succeeding years the loss should be taken on the crop from the preceding year and the new crop should be stored unless additional storage space is available, and (4) storage facilities having been provided, they should be used whenever the feeds production exceeds 104 per cent of the normal.

Report of the Royal Grain Inquiry Commission, W. F. A. TURGEON ET AL. (*Ottawa: Govt., 1925, pp. 217*).—This is a report of the findings and recommendations of the commission on the subject of the buying, handling, transportation, and selling of grains in Canada, with special attention to the grading and weighing; handling at country points; operation of terminal, public, and private elevators; mixing of grain; and the disposition of screenings. The financing of the grain movement, the operation of the Winnipeg Grain Exchange, the markets and trade routes for Canadian wheat, the Government elevators, and the administration of the Canadian Grain Act are also described. Appendixes contain (1) a report on an investigation made by one of the commissioners in the British Isles and Netherlands regarding the receiving, handling, weighing, storing, and transportation of Canadian wheat; the intrinsic and comparative values of such wheat; impressions as to grade standards; buying on Canadian certificate final and f. a. q. (fair, average quality); public storage; deterioration of Canadian grades while passing through the United States in bond; methods of purchase from other countries; etc.; and (2) a memorandum of one of the commissioners setting forth the existing grain transportation problems and his suggestions for the solution of these problems.

Wheat acreage and production in the United States since 1866, H. WORKING (*Wheat Studies, Food Research Inst. [Stanford Univ.], 2* (1926), No. 7, pp. 237–264, figs. 8).—Study has shown that the official estimates and census

figures of wheat acreage and production in the United States prior to 1902 were too low, in some years as much as 30 to 40 per cent. The original official estimates show slight decreases in the period between 1880 to 1895, while later study shows an increase of some 15 per cent. The original estimates for 1900 to 1910 indicate that the acreage was substantially constant, except for year-to-year fluctuations. Data now available show that a peak was reached in 1899 that was not equaled until 1915, and that between 1899 and 1907 there was a decline of nearly 20 per cent to the lowest level after 1885.

This report discusses the basis of the earlier estimates, the changes in the methods of making these estimates, the evidence and sources of error in them, the detailed steps of the Food Research Institute in deriving the formulas and results in its revision, and the reliability and limitations of its revision. Since 1910 errors in the official estimates correctable by Food Research Institute methods are so small that the revision was not extended beyond that year. Tables and charts are included showing the acreages, yields, and production, according to the old estimates and the revisions; the domestic retention of wheat; and the theoretical production and acreage, according to Institute methods.

Peaches, H. R. Wellman (*Calif. Agr. Col. Ext. Circ. 1 (1926), pp. 64, figs. 43*).—This bulletin is the first of a series discussing the economics of an important California crop. Statistics for the production and marketing of peaches collected by Federal and State bureaus and by private agencies are presented in tabular and graphic form. The data presented indicate (1) that the purchasing power of canned peaches is not likely to rise and may decline during the next few years, because of (*a*) the increased production due to plantings in areas where yields are high, (*b*) the increasing production of competitive fruits—pineapples, pears, apricots, and cherries, and (*c*) the fact that the buying power of consumers can not be expected to increase; (2) that the price of dried peaches will not rise much above that of fresh or canned peaches; and (3) that the purchasing power of fresh peaches has declined more rapidly than that of canned or dried fruit and has caused the production to shift to areas of low cost, resulting in California facing a greater competition than in the past.

"Can New Hampshire produce more of what she eats?" H. C. Woodworth, L. B. Lincoln, and H. I. Richards (*New Hampshire Sta. Bul. 222 (1926), pp. 47, figs. 21*).—The results of a state-wide survey made in 1925 to determine the demand for fresh fruits, fresh and dried vegetables, poultry, eggs, and butter, what amounts of such products are being shipped into the State, and what amounts are being supplied by growers within the State are set forth. Tables are given showing for each of 7 districts of the State the amounts of the several commodities purchased by retail stores, hotels, and camps from farmers and from others during the competing and the noncompeting seasons, and for 16 cities and towns the amounts of the several commodities purchased by retail stores from farmers and from others.

The survey shows (1) that large quantities of butter, poultry, eggs, and vegetables are being shipped into the State, a high percentage of the latter, however, coming in in the noncompeting season; (2) that notwithstanding the large shipments of butter, eggs, and poultry into the State, large quantities of whole milk, eggs, and chickens are being shipped out, due to more profitable markets; (3) that during the competing season local production nearly supplies local markets with a considerable number of vegetables; (4) that the production for local markets of potatoes, cabbage, celery, asparagus, and cold-frame tomatoes could be increased; (5) that the advisability of local production of dry beans, onions, and butter on a commercial scale may be questioned; and

(6) that most of the vegetables, poultry, and eggs used by the White Mountain hotels are purchased outside of the State. These hotels demand a large dependable supply of the highest quality of products and quick deliveries, which makes it difficult for local producers to compete with Boston wholesalers.

Farmers' cooperative business study, A. V. SWARTHOUT (*U. S. Dept. Agr., Dept. Circ. 397 (1926), pp. 56, figs. 13*).—This is a study of the organic set-up, operations, membership relations, and selling program of the Staple Cotton Cooperative Association at Greenwood, Miss., made with a view to bringing out the experiences of the association that may be helpful to other cooperative associations. From its organization in 1921 to 1924 the association marketed over 555,000 bales of cotton at an average net operating cost of $1.70 per bale, or 1.2 per cent of the sales value, and during the 1924–25 season it sold nearly 92 per cent of its cotton direct to mills. The new marketing agreement for the years 1925 to 1930 is set forth, and the changes from the agreement made in 1921 and their probable and possible effects are discussed.

Farm bureau-farm management service project in Illinois, H. C. M. CASE (*Jour. Farm Econ., 8 (1926), No. 3, pp. 311–323*).—This paper, read at the sixteenth annual meeting of the American Farm Economic Association in December, 1925, describes the organization and operation and the service rendered by a project of the University of Illinois in which 240 farmers cooperate for keeping farm accounts and studying the efficiency with which their farm operations are being conducted.

Cooperative livestock shipping associations (*U. S. Dept. Agr., Farmers' Bul. 1502 (1926), pp. II+28, figs. 4*).—This is a revision of Farmers' Bulletin 1292, previously noted (E. S. R., 48, p. 688).

The reasons for and advantages of cooperative livestock shipping associations and the causes of failure of such associations are discussed. Information regarding the organizing, incorporating, and operating of such associations and suggestions as to matters to be observed in marking stock are given. A suggested form of by-laws is included.

A Welsh farmers' co-operative society, A. G. RUSTON (*Jour. Min. Agr. [Gt. Brit.], 32 (1926), No. 12, pp. 1078–1089, pls. 3, fig. 1*).—Cooperative societies for the purchase of agricultural requisites in Wales have increased from 9 formed in 1902 to 75 of the 193 in England and Wales in 1923. In 1908, 77 Welsh farmers formed the society described. From 1908 to 1924 this membership increased to 121, its capital actually paid in by members from £48 7s. 6d. to £1,194 17s. 6d., and its sales from £1,027 15s. 2d. to £32,645 10s. 11d. In 1924 its profits amounted to £928 8s. 5½d. and its reserve had accumulated to £5,470 11s. 3½d. The society's success has rested on the loyalty of its members, its low working costs, and its high capital turnover. An analysis is given of the society's sales, working costs, profits, financing, investments, assets, and liabilities.

The development of rural sociology, C. R. HOFFER (*Amer. Jour. Sociol., 32 (1926), No. 1, I, pp. 95–103*).—The study of rural society has arisen chiefly from a need for knowledge about the human factor engaged in agricultural production. From 1910 to 1915 courses in rural sociology were added in most of the agricultural colleges and in many other colleges. In 1925 one or more courses were carried in 501 institutions as follows: State universities and colleges 34, State agricultural colleges 19, private universities and colleges 201, State normal schools and industrial institutions 134, theological seminaries 39, and county normal training schools 76. Some institutions are offering graduate courses and making provision for research, but as yet most of the research work is being done by the U. S. Department of Agriculture and the State agricultural experiment stations.

The present tendency is for the studies to be minute in detail, as is shown by a brief summary of some of the existing projects. A few institutions, notably the English and history departments of Iowa State College and Michigan State College, have courses in rural life in other than the departments of sociology or economics.

American villagers, C. L. Fry (*New York: George H. Doran Co., 1926, pp. XVII+19–201, figs. 7*).—This is a statistical study of village problems based upon the more important published material about villages and unpublished data of the U. S. Census Bureau. The primary purpose of the book is to indicate the significance of the data published in A Census Analysis of American Villages, previously noted (E. S. R., 54, p. 886). Some of the more important findings of the present study are as follows:

Nearly one-eighth of the population of the United States lives in villages, which are in general scattered over the country in much the same proportions as the population as a whole. From 1900 to 1920 villages increased in population more rapidly than the Nation as a whole. Agricultural villages are the most common type, but the composition and characteristics of their populations differ widely from region to region. The social-economic status of men gainfully employed in villages is much the same in all regions, manufacturing pursuits engaging the largest group. The inhabitants of middle western villages are the most prosperous. Child labor in southern villages is partly a result of economic pressure. Villagers differ from city dwellers in having higher proportions of native whites and of old people. On a number of important points villagers differ as widely from open-country population as from city dwellers. Medical services performed by villages are decidedly less adequate than those performed by cities.

Appendixes include (1) an analysis of the rural and urban population figures of the 1920 census for Massachusetts and Rhode Island, which indicates that the rural population of New England should be about 30 per cent greater than the total given by the census; (2) a classification of gainfully employed workers according to their social-economic status; and (3) an article by L. S. Cressman on The Social Composition of the Rural Population of the United States, previously noted (E. S. R., 55, p. 187).

Nebraska agricultural statistics, 1925, compiled by A. E. Anderson (*Lincoln: Nebr. Dept. Agr., [1926], pp. 164, pls. 4, figs. 37*).—This report, issued in cooperation with the U. S. Department of Agriculture, includes statistics as to land classification, tenure, and values; acreages, yields, values, and monthly prices of principal crops; numbers and values of livestock; quantities, values, and monthly prices of poultry and dairy products and quantities and values of apiary products; farm population; farm wages; roads; home conveniences; motor vehicles; etc. Comparative data are included for from 2 to 60 years.

Statistical atlas of the Bombay Presidency, [H. H. Mann] (*Bombay: Govt., 1925, 3. ed., rev., pp. [3]+194, pls. 72*).—The present atlas is the third edition of the atlas prepared and revised under the Famine Relief Code of 1904. Its purpose is to include all the information, agricultural and otherwise, likely to be useful to an officer, especially during impending scarcity or famine. It includes data for a normal year (1922–23) and one of a serious widespread famine (1918–19), together with data for past famines, plagues, floods, yields of crops, prices, etc.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

The aims and work of the Hertfordshire Institute of Agriculture (*Reading, Eng.: Philip Palmer Press, 1925, pp. 9–72, pls. 2, figs. 28*).—The institute is both a county residential agricultural school and the headquarters of the

county agricultural staff. The courses vary in length from a few weeks to a year, and include both practical and technical agriculture. The aims, methods, equipment, work, etc., of the institute are described.

Farm institutes and their work, J. R. BOND (*Jour. Roy. Agr. Soc. England, 86 (1925), pp. 89–98, figs. 4*).—The farm institute is a county council activity to fill the field for intermediate agricultural education between the college diploma course and the county day class, which meets on one or two days per week from ten to twenty weeks. The typical farm institute comprises a farm of medium size with residential accommodations for 20 to 50 students, lecture rooms, laboratories, and teaching staff. Agricultural courses of direct practical importance are given from October to March, and courses for women are held during the summer. The origin and development of such institutes, the policies in different counties, the still mooted questions of policies, the duties of county lecturers, the purpose of the farm institute, age of students, etc., are briefly described.

Reconstruction of the Chinese rural elementary school curriculum to meet rural needs in China, P. C. FUGH (*Chinese Social and Polit. Sci. Rev., 9 (1925), Nos. 1, pp. 1–51, pls. 2; 2, pp. 282–333, pl. 1; 4, pp. 732–768; 10 (1926), Nos. 1, pp. 183–211; 2, pp. 383–421; 3, pp. 633–657, fig. 1*).—Modifications in the curriculum and other changes, principally in the way of the elimination of Chinese classics as a subject in itself, the introduction of new subjects having a social and industrial significance, and the relief of the overcrowded study schedule, are set forth. The prevailing teaching methods and the kinds of textbooks in use are noted. A number of reform schemes have been recently introduced, certain of which are discussed in detail. Consideration is given to the health situation in China, particularly in rural districts, the extent to which adverse conditions can be improved, the fundamental principles of health education, and the means the Chinese rural elementary school may employ in improving conditions.

Farm measurements, A. G. RUSTON and C. V. DAWE (*London: W. B. Clive, 1926, pp. X+163, figs. 69*).—A textbook covering the problems of mensuration arising in farming operations.

Farm calculations and accounts, A. G. RUSTON and C. V. DAWE (*London: W. B. Clive, 1926, pp. X+222, figs. 7*).—A textbook covering the problems arising in computing farm operation costs and keeping farm records and accounts.

FOODS—HUMAN NUTRITION

Chemistry of food and nutrition, H. C. SHERMAN (*New York: Macmillan Co., 1926, 3. ed., rewritten and enl., pp. XII+636, figs. 20*).—The remarkable progress which has been made in the science of nutrition in the past decade is reflected in the present revision of this authoritative text (E. S. R., 38, p. 661), which contains about 200 pages of new material. A considerable part of the additional subject matter is devoted to separate chapters on vitamins A, B, C, and D, and a portion of a chapter on vitamin E. Other new material is presented in the chapters entitled Iodine in Nutrition: Simple Goiter as a Nutritional Problem, and on Chemical Nature and Regulation of Oxidation Processes in the Body. The latter, in which is reviewed the chemistry of glutathione, thyroxin, adrenaline, hemoglobin, and insulin, is of particular interest in suggesting the underlying relationships of the energy, protein, and mineral metabolism and probably some of the phenomena of vitamin action. A table on the occurrence of vitamins A, B, and C and a brief discussion of the statistical treatment of the data of nutrition investigations have been added to the appendixes.

Foods and condiments, their composition and influence on health, with special emphasis on the ash constituents, R. BERG (*Die Nahrungs- und Genussmittel, ihre Zusammensetzung und ihr Einfluss auf die Gesundheit, mit Besonderer Berücksichtigung der Aschenbestandteile. Dresden: Emil Pahl, 1925, 3. ed., enl., pp. 67*).—A reprint of the first edition (E. S. R., 32, p. 561), with an appendix containing a brief discussion of vitamins and a table of their occurrence.

The rational place of wheat flour in diet, C. O. SWANSON (*Northwest. Miller, 147 (1926), No. 4, pp. 327, 370*).—A discussion of the composition of flour with reference to its nutritive deficiencies and the choice of foods to remedy these deficiencies.

Our future flour supply, C. A. ALSBERG (*Jour. Home Econ., 18 (1926), No. 2, pp. 68–72*).—This paper, presented at the 1925 meeting of the American Home Economics Association, is essentially a plea for the education of housewives to the use of soft wheat flour for the purposes to which it is best adapted, such as biscuits and cakes, instead of the indiscriminate use of strong flours.

Mechanical modification of dough to make it possible to bake bread with only the fermentation in the pan, C. O. SWANSON and E. B. WORKING (*Cereal Chem., 3 (1926), No. 2, pp. 65–83, figs. 3*).—Essentially noted from another source (E. S. R., 55, p. 189).

A study of the nutritive value of gelatin, T. B. DOWNEY (*Jour. Metabolic Research, 5 (1924), No. 4–6, pp. 145–168, figs. 8*).—This is the complete report of an investigation previously noted from another source (E. S. R., 54, p. 189).

The food value of the banana, compiled by SKINNER, SHERMAN, and ESSELEN, INC. (*Boston: W. M. Leonard, 1926, pp. 22*).—A compilation from the literature on the nutritive value of bananas.

Cultured milk as a medicinal agent: *Lactobacillus acidophilus* and acidophilus milk, G. L. A. RUEHLE (*Michigan Sta. Quart. Bul., 9 (1926), No. 1, pp. 24–26*).—A nontechnical description of the preparation and therapeutic value of acidophilus milk.

The effect of short periods of cold storage on beef and mutton, W. M. CLIFFORD (*Biochem. Jour., 19 (1925), No. 6, pp. 998–1003*).—Samples of beef and mutton placed in cold storage at temperatures of 25 and 35° F. were analyzed at intervals of 2 or 3 days up to from 10 to 13 days for total, soluble, and amino nitrogen, carnosine, and creatine expressed as creatinine, and examined for physical changes. The experiments were carried out in July, 1925, when the weather was very hot and sultry.

Both beef and mutton kept at either temperature appeared identical with freshly killed meat up to the third day of storage. At the lower temperature both showed ice spicules and the characteristic red color of frozen meat on the sixth day. By the eighth day the samples kept at 35° showed evidence of spoilage. The chemical analyses showed no change in composition of the meat until after the third day at 35° and the thirteenth day at 25°.

To account for the comparatively rapid decomposition of fresh meat kept at 35° when the outside weather conditions are hot and sultry two suggestions are made. "The first is that in hot weather post-mortem changes take place more rapidly in the meat during the period between slaughter and the time when it attains the temperature of the chilling room than is the case in cold weather. The second explanation is that the outside air drawn into the freezing chamber is more heavily laden with bacteria in hot weather than in cold, and consequently the organisms are able to decompose the meat by sheer numbers even at a temperature where bacterial action is necessarily retarded.

If this is so, the storage properties of a chilling room should be greatly increased by some method of filtering the air before it is allowed to enter the storage chamber."

How to pickle chayotes (*Fruit Prod. Jour. and Amer. Vinegar Indus., 5 (1925), No. 4, p. 17, fig. 1*).—Brief directions are given for pickling chayotes in weak brine with dill and mixed spices, and for making sweet and sour pickles from chayotes cured in strong brine.

If you must cook, J. LEE (*New York: Dodd, Mead & Co., 1926, pp. IX+174*).—An original and helpful presentation of the principles of cooking by one who believes that "learning to follow a recipe is not learning to cook," and that cooking "is an art and as an art it must be studied in the spirit of all art."

The effect of temperature on metabolism, particularly that of protein, G. E. YOUNGBURG and M. W. FINCH (*Jour. Biol. Chem., 68 (1926), No. 2, pp. 335–341, figs. 2*).—Analyses are reported of 12 monthly collections of 24-hour urines of 10 subjects (the senior author, a member of the staff, and 8 medical students) at the University of Buffalo Medical School, Buffalo, N. Y. The total nitrogen excretion for each subject and the average urinary excretion for the 10 subjects are shown graphically. The average data per kilogram per 24 hours for the 10 subjects are as follows: Volume 18.5 cc., total nitrogen 0.165 gm., ammonia nitrogen 6.57, uric acid 6.67, creatinine 24.4, and sodium chloride 0.161 gm. The average total urinary nitrogen per 70-kg. man was 11.3 gm., as compared with 11.07 gm. reported by Denis and Borgstrom for medical students in the South (E. S. R., 52, p. 761) and much lower than these authors reported for medical students of New England.

The authors conclude that seasonal variations in temperature in temperate zones are not sufficient to influence the level of protein metabolism in man.

Lipid excretion.—III, Further studies of the quantitative relations of the fecal lipids, W. M. SPERRY (*Jour. Biol. Chem., 68 (1926), No. 2, pp. 357–383, fig. 1.*).—In this report of a continuation of the series of studies previously noted (E. S. R., 52, p. 665), the term lipid is used in place of fats or lipoids in accordance with the recommendations of the International Union of Pure and Applied Chemistry.

Dogs weighing between 5 and 13 kg. were found to excrete an average of 1.5 to 2 gm. of nonvolatile lipids per week on a lipid-free diet. Of this from 35 to 40 per cent consisted of unsaponifiable matter and from 55 to 60 per cent of nonvolatile acids. Of the latter, the solid fraction making up about 30 per cent of the whole consisted of palmitic and stearic acids and the liquid fraction almost entirely of an acid with one double bond, probably oleic, together with small amounts of an acid with four double bonds, probably arachidonic. Volatile acids were identified as consisting of approximately 65 per cent acetic, 23 per cent butyric, and 12 per cent caproic acids.

In discussing the source and purpose of lipid excretion, the general conclusion drawn is as follows: "The presence of usable fatty acids not bound to sterols makes it probable that fecal lipids enter the intestine through its walls below the absorbing portion rather than through the bile. The similarity to plasma lipids indicates that they represent some sort of a leakage, and the suggestion has been made that the leakage has the purpose of lubricating the intestine. On the other hand some evidence has been presented in favor of the view that the lipid excretion is concerned with removing undesirable or excess sterols from the organism. Further work is being carried on in an attempt to settle more definitely the purpose of lipid excretion."

Carbohydrate metabolism and insulin, J. J. R. MACLEOD (*London and New York: Longmans, Green & Co., 1926, pp. XII+357, pls. 4, figs. 26*).—This volume, which is one of the series of Monographs on Physiology edited by E. H. Starling, contains a historical review of the researches leading to the isolation of insulin, a discussion based largely upon work done in the author's laboratory of the preparation, chemical properties, and physiological action of insulin, and a review of the advances in the knowledge of the metabolism of the carbohydrates made possible through the use of insulin. The final chapter deals with the pharmacological assay of insulin. A bibliography is appended to each chapter.

Sunlight and health, F. F. TISDALL (*Amer. Jour. Pub. Health, 16 (1926), No. 7, pp. 694–699*).—A paper presented at a symposium on light at the American Health Congress at Atlantic City, N. J., May 21, 1926.

Ten years of vitamin research, M. S. ROSE (*Jour. Home Econ., 18 (1926), Nos. 5, pp. 248–253; 6, pp. 308–316*).—A concise summary of the important advances of the past decade in the knowledge of vitamins, with a discussion of their significance in human nutrition.

Studies of the vitamin potency of cod liver oils.—VIII, Potency of haddock liver oil, A. D. HOLMES (*Jour. Metabolic Research, 5 (1924), No. 4–6, pp. 259–262, fig. 1*).—Samples of crude oil prepared from the fresh livers of spawning haddock were found to have the following chemical and physical constants: Specific gravity at 25° C. 0.923, refractive index at 20° 1.479, saponification value 188.2, iodine value 164.2, and acid value 0.9768. Tests for vitamin A indicated a dosage of between 1 and 2 mg. daily as the minimum requirement for growth of young rats.

Mammary secretion.—VI, Vitamin B and the lactating rat's diet. 1, The quantitative relation of vitamin B to protein. 2, Vitamin B requirement of the lactating and nonlactating rat (preliminary note), G. A. HARTWELL (*Biochem. Jour., 19 (1925), No. 6, pp. 1075–1081, figs. 3*).—In the first part of this paper a study is reported the results of which are thought to confirm the conclusion drawn in the previous paper of the series (E. S. R., 52, p. 364) that there is a quantitative relation between the protein and vitamin B requirements of lactating rats. The diet in the present study was made up of purified materials in order to estimate the protein more accurately, and consisted of caseinogen and potato starch in different portions, salt mixture, and washed butter, with a marmite solution incorporated in the food as a source of vitamin B. The same technique was employed as in previous studies of the series.

On the diet containing 20 per cent of caseinogen, from 6 to 8 gm. of marmite per 20 gm. of caseinogen was considered necessary for successful rearing of the young. On 4 gm. of marmite the young had spasms, and on 2 gm. nearly all died. A few young survived in the entire absence of marmite, but the mother lost weight during lactation and the young were in poor condition when weaned. This was also true when the diets were low in protein (10 per cent caseinogen).

A supplementary experiment is reported in which 12 young rats were fed the synthetic diet, with 2 gm. daily of marmite. The growth of all was satisfactory, indicating that much less vitamin B is required for growth than for lactation.

The metabolism of vitamine B as one of the food constituents; its excretion in the pigeon, J. A. COLLAZO and C. FUNK (*Jour. Metabolic Research, 5 (1924), No. 4–6, pp. 195–204*).—Pigeons were fed varying amounts of yeast as the source of vitamin B and water extracts of their excreta used as a source of

vitamin B for other pigeons to determine the extent of excretion of vitamin B under varying conditions.

The results reported indicate that on diets containing no vitamin B or only an amount sufficient for maintenance none is excreted, but that the vitamin is present in the excreta when the food supply furnishes an abundance of it. This was equally true when peas instead of yeast served as the source of vitamin B.

It is noted that the extracts of the feces containing vitamin B were of a yellow color and the vitamin-free extracts green. It is suggested that the absence of vitamin B affects the chemistry of the bile pigments, and that this change of color can be used as an early sign of a deficiency of vitamin B.

Studies on the effect of ultra-violet light on avitaminoses.—II, Further experiments with pigeon beriberi [trans title], J. Kříženeckÿ (*Pflüger's Arch. Physiol., 211 (1926), No. 6, pp. 663–665*).—The previous conclusion that irradiation with ultra-violet light has no curative or preventive effect on avian polyneuritis (E. S. R., 52, p. 366) has been confirmed by experiments in which the feathers of the pigeons were removed before irradiation.

The question of the formation of antirachitic vitamin D in germinating seeds [trans. title], W. Stepp (*Ztschr. Biol., 83 (1925), No. 1, pp. 99–101*).—*Evidence is presented that vitamin D is not synthesized in seeds on germination.*

The simultaneous experimental production of severe xerophthalmia and rickets in young rats.—A simple method for demonstration purposes [trans. title], W. Stepp (*Ergeb. Physiol., 24 (1925), pp. 67–70*).—The author recommends as a diet suitable for inducing severe rickets and ophthalmia in young rats oats 40, casein 5, sodium chloride 1, calcium carbonate 3, and dextrin 51 parts. This differs from the vitamin A-free diet of McCollum et al. only by an increase in the calcium carbonate from 1.5 to 3 parts and a corresponding decrease in dextrin.

TEXTILES AND CLOTHING

Simple portable photometer for gauging intensity of ultra-violet rays, F. W. Alexander (*Abs. in Analyst, 51 (1926), No. 598, p. 54*).—The apparatus described, termed "U-V-Scope," indicates by the degree of fluorescence the intensity of the ultra-violet rays in the radiation emitted from quartz mercurial vapor lamps. Certain textile fabrics were tested and according to the brilliancy obtained were found to transmit the near ultra-violet rays in the following order: Expensive make of artificial silk, Jap silk and silk stockings, nainsook and very cheap cotton stockings, fine linen, long cloth and calico, and unbleached calico.

Practical results of cotton industry research (*Textile Mercury, 75 (1926), No. 1957, pp. 349, 350, fig. 1*).—Report is made of the progress of those research activities of the Shirley Institute of the British Cotton Industry Research Association which were concerned during 1925–26 with sugar on cotton fibers, damage or tendering by mildew, standard of regain, high draft yarns, scutcher tests, sizing experiments, emulsifying agents in scouring, and tendering by light.

The microscopical examination of damaged cotton hairs by the Congo Red test and the swelling test of Fleming and Thaysen, T. B. Bright (*Jour. Textile Inst., 17 (1926), No. 8, pp. T396–T404, pls. 4*).—This paper describes the application of the Congo Red test in determining microscopically in a Sakel cotton the visible signs of damage resulting from heat, mechanical means, the action of a fungus, or the action of acid. Changes caused in cotton fibers by treatment in the cold with sulfuric acid of varying concentration were of a

different nature from the other forms of damage. The swelling test of Fleming and Thaysen is also considered.

The detection of mercerized cotton, C. E. Mullin (*Textile Colorist, 48 (1926), No. 573, pp. 599–601*).—A résumé of methods developed for the detection of mercerized cotton, including the iodine, benzopurpurin, Kinkead, and sulfuric acid-formaldehyde tests.

Year book of the National Association of Cotton Manufacturers with cotton manufacturers manual, 1926 (*Boston: Natl. Assoc. Cotton Manfrs., 1926, pp. 313, figs. 20*).—This manual describes the organization, tabulates statistics of cotton production and manufacture, and in the technical section presents reference data including weight equivalents, conversion tables, power transmission data, roving, yarn and cloth tables, humidity charts and tables, knitting information, textile test methods, and sales notes.

The sulphur content of wool.—I, Inherent variations according to the type of wool, J. Barritt and A. T. King (*Jour. Textile Inst., 17 (1926), No. 8, pp. T386–T395, fig. 1*).—Of the methods available for determination of sulfur the Carius method used appeared most suitable for a substance of the nature of wool. Regains determined by a modified method of thorough drying somewhat exceeded those obtained with the commercial conditioning oven.

An inherent variation in the sulfur content was apparent according to the type of wool. In general the finer qualities have more sulfur than the coarser. Definite variations are also observed between different wools of the same quality and breed, and in pedigree flocks the sulfur content varies with different animals. Variations were also noted in different parts of the same fleece and apparently in different shearings in the same animal. Kempy wools showed a lower sulfur content than nonkempy wools. Typical percentages of sulfur on dry weight were Australian merino 3.76; lamb's wool merino 3.73; Lincoln, white 3.1, and yellow 3.26; Turkey mohair, fine 3.36, and coarse 3.03; fine Ripon fleece 3.34; Peruvian, in 1924 3.75, and in 1925 3.82; Blackface, fine 3.82, coarse 3.33, and kempy 3.24; Welsh mountain, first clip 3.79, and second clip 3.97; and Cape merino 4 and 3.94.

The bleaching of wool with sulphur dioxide, E. F. H. Cook (*Jour. Textile Inst., 17 (1926), No. 8, pp. T371–T378*).—This is a summary of the literature on bleaching of wool with sulfur dioxide, with a bibliography of 40 titles.

A comparison of the properties of silk and rayon, R. Presgrave (*Natl. Cleaner and Dyer, 17 (1926), No. 10, pp. 71–73*).—Silk and rayon are compared as to luster, dyeing qualities, feel, conductivity, hygroscopicity, tensile strength, elasticity, ductility, friability, resiliency, specific gravity, cleanliness, plasticity, imperfections, and cost of production.

The action of micro-organisms on silk, T. F. Heyes and H. S. Holden (*Jour. Soc. Chem. Indus., 45 (1926), No. 31, pp. 262T–265T*).—The *Aspergillus* spp. studied at the University College, Nottingham, England, were found to grow fairly readily on silk, whatever its condition, without causing tendering, the only damage being discoloration in case of molds with colored spores. Most species grew readily on the gum obtained from spun silk, which is acid in reaction, as it contains free fatty acid derived from the spinning oil. This acid may explain why the bacteria tried, except *Bacillus proteus*, did not grow at ordinary temperatures. Except with *B. mycoides*, there was little evidence of growth of the bacteria investigated. Several species appeared to cause slight tendering in silk when incubated at 37.5° C. (99.5° F.), but only *B. mycoides* and perhaps *B. proteus* caused any tendering at ordinary temperatures. The dyeing properties were not affected by these bacteria.

MISCELLANEOUS

Thirty-eighth Annual Report [of Mississippi Station], 1925, J. R. Ricks et al. (*Mississippi Sta. Rpt. 1925, pp. 58*).—This contains the organization list, a report of the director on the work of the station, a financial statement for the fiscal year ended June 30, 1925, and departmental reports, the experimental work in which is for the most part abstracted elsewhere in this issue.

Thirty-ninth Annual Report of [Nebraska Station, 1925], E. A. Burnett and W. W. Burr (*Nebraska Sta. Rpt. [1925], pp. 42*).—This contains the organization list, a report of the work of the station, and a financial statement for the fiscal year ended June 30, 1925. The experimental work not previously reported is for the most part abstracted elsewhere in this issue.

Director's Biennial Report [Oregon Station], 1922–1924, J. T. Jardine (*Oregon Sta. Bien. Rpt. 1923–24, pp. 98*).—This contains the organization list and a report of the director for the biennium ended June 30, 1924, including synopses of departmental reports and notes on the substations. The experimental work reported is for the most part abstracted elsewhere in this issue.

Michigan Agricultural Experiment Station Quarterly Bulletin, [August, 1926], edited by R. S. Shaw and E. B. Hill (*Michigan Sta. Quart. Bul., 9 (1926), No. 1, pp. 30, figs. 5*).—In addition to articles abstracted elsewhere in this issue, this number contains the following: Fiber Flax Variety Test, 1925, by B. B. Robinson, and Dangers from Poisonous Gases in Silo Filling, by F. W. Fabian.

Bimonthly Bulletin of the Ohio Agricultural Experiment Station, [July–August, 1926] (*Ohio Sta. Bimo. Bul., 11 (1926), No. 4, pp. 129–160, figs. 15*).—In addition to articles abstracted elsewhere in this issue, this number contains one entitled Cows on Pasture Need Other Feed.

Research and the land, V. E. Wilkins (*London: Min. Agr. and Fisheries, 1926, pp. XIV+388, [pls.] 29*).—This book is discussed editorially on page 601.

Plant nutrition and crop production, E. J. Russell (*Berkeley: Univ. Calif. Press, 1926, pp. IX+115, pls. 21, figs. 37*).—The lectures included in this book are discussed editorially on page 605.

Catalogue of the printed books on agriculture published between 1471 and 1840, with notes on the authors, M. S. Aslin (*[Harpenden, Eng.]: Rothamsted Expt. Sta. Library, [1926], pp. 331, pls. 22*).—This catalogue of early books in the Rothamsted Experimental Station Library is discussed editorially on page 606.

NOTES

Arkansas University and Station.—A farm of 160 acres near Stuttgart in Arkansas County has been donated as the site of the new rice substation. This farm consists of four 40-acre plats, adjoining for over a mile the highway from Stuttgart to De Witt, and is located in the center of the rice industry. G. H. Banks has been appointed assistant director in charge of the substation. The university now owns three farms on which substations are located and all donated by citizens of the community, the others being one for cotton at Marianna and one for fruit and truck crops at Hope.

Drs. R. P. Bartholomew and G. A. Jansen have been appointed assistant professors of agronomy for both teaching and research.

California University.—M. E. Jaffa, professor of nutrition and the oldest professor in point of service in the university because of his appointment in 1880 as assistant in agriculture, has retired with the title of professor emeritus.

Iowa College.—The first section of a boys' dormitory with accommodations for 120 students is to be erected in the near future, and it is expected will be ready for occupancy next fall.

Kansas College and Station.—Mrs. Belle Selby Curtice of the class of 1882 has donated $1,000 to be used for loans to needy and worthy women students, preference to be given to students in home economics. Dr. N. D. Harwood, assistant in vaccine laboratories in the station, resigned October 22 to engage in commercial work.

Louisiana University.—Col. Campbell B. Hodges, at one time commandant of cadets in the university and at present assigned to duty at West Point, has been appointed president to succeed President Emeritus Thomas D. Boyd. His acceptance, however, has been withheld pending its sanction by the War Department.

Massachusetts College.—Dr. Charles Wellington, for 38 years associated with the department of chemistry, died November 15 at the age of 73 years. Dr. Wellington was a graduate of the college in 1873 and was among its earliest students to specialize in chemistry. In 1877 he was appointed an assistant chemist in the U. S. Department of Agriculture and later became first assistant chemist, meanwhile continuing his studies at the University of Virginia. In 1882 he resigned to study in Germany, and after three years at Leipzig, Berlin, Paris, and Göttingen received the Ph. D. degree from the last-named institution. Returning to this country he was appointed associate professor of chemistry in the college in 1885. Following the death of Dr. Charles A. Goessmann in 1907, he served as head of the department until 1911 and as professor of chemistry until his retirement in 1923. During this long period many students who became conspicuous along chemical lines were enrolled in his classes. Resolutions adopted by the Alumni Association at the close of his twenty-fifth year of service commended him for his untiring energy and staunch loyalty to the college, his faith in the future, and his zeal in the training of his students, in whose advancement he was keenly interested. He was also an ardent advocate of agricultural research and a firm believer in its promotion.

Michigan College.—The total enrollment is reported as 2,571 as compared with 2,314 in 1925 and 1,448 in 1920. The agricultural students, however, number 400 as compared with 426 in 1925 and 519 in 1920.

New Hampshire University and Station.—Dr. Charles S. Murkland, president of the college from 1893 to 1903 and during most of this period acting director of the station, died November 11 at the age of 70 years. In these dual capacities he was a leading figure in the development of the institution in its first decade. He was also active in the Association of American Agricultural Colleges and Experiment Stations, particularly as regards the interests of engineering.

Rutgers University and New Jersey Stations.—Allen G. Waller, research specialist in agricultural economics, has been appointed chief in agricultural economics in the stations. Henry Keller, jr., has severed his connection with the stations and is giving full time to resident instruction as associate professor in agricultural economics.

Cornell University.—Dick J. Crosby, professor of extension teaching since 1915 and nationally known for his studies of problems in agricultural instruction, died November 15 at the age of 60 years.

Professor Crosby was a native of Michigan and a graduate of the Michigan College, receiving the B. S. degree in 1893 and the M. S. degree in 1901, and served there as instructor in English and editor from 1893 to 1899. In 1901 he was appointed an assistant in the Office of Experiment Stations, U. S. D. A., and from 1908 to 1913 was head of the agricultural education service. He was the author or joint author of a long list of reports and other publications dealing with various phases of agricultural education, and for many years rendered a unique service to the Association of American Agricultural Colleges and Experiment Stations and the Association of Land-Grant Colleges through his contributions to teaching problems carried on under the auspices of the committee on instruction in agriculture. His work as professor of extension teaching was also a notable venture in the new field of providing special training for prospective extension workers, and had been attended with much success.

New York State Station.—In a test of varieties made at the station during the past season, 10 tons of pumpkins and squashes were harvested, embodying a great diversity of sizes, forms, and colors. The tests included 38 varieties of summer squash, 70 varieties or strains of winter squash, 20 varieties of vegetable marrows, and 30 varieties of pie pumpkins. Cooking tests are now in progress with many of the less well-known varieties to determine their usefulness in the home or for canning purposes. These tests are part of a plan to try out on the station grounds all varieties of the different vegetables that will grow in New York in much the same way that the station has tested hardy fruit varieties. Eventually, it is expected that the information gained in these tests will be made available in a series of books on vegetables similar to the well-known treatises on fruits.

That improvement of dairy herds through the use of purebred sires may be accomplished with a comparatively small outlay of money is indicated by a study made with the station herd, beginning in 1900 with two purebred Jersey cows as foundation stock. Seven bull calves have been purchased from purebred herds and upon reaching maturity have been placed at the head of the herd. These calves have all been of good breeding, but have represented a type which can be purchased to-day at a price well within the reach of most dairymen, their average annual cost through 1924 being only $31.82. Since 1924, however, the cost of the sires has greatly increased because of the selec-

tion of animals of exceptional breeding, necessitated by the high quality of the herd and the corresponding difficulty of further improvement.

Ohio State University.—Two new greenhouses have been added to the equipment of the horticultural department at a cost of $12,000. One is a vegetable house 36 by 78 feet and the other a flower house 25 by 90 feet.

Wisconsin Station.—A meeting of livestock men and farmers was recently held to discuss the contemplated experimental work on contagious abortion in cattle. A five-year appropriation of $10,000 per annum has been made available by the Wisconsin Manufacturers Association for this purpose, and a careful study of this disease, especially from the nutrition standpoint, is being undertaken. A selected group of animals has been divided into two herds, one to be fed an adequate ration and the other a limited one. Both groups will be artificially infected with contagious abortion, and an attempt will be made to ascertain such nutritional effects as may develop. It is reported that the dairymen of the State are spending large sums of money for mineral feeds, which are sometimes sold on the claim that they are helpful in controlling the abortion disease. It is hoped that these trials will demonstrate whether or not there is any merit to these claims.

Three new varieties of yellows resistant cabbage are reported by the department of plant pathology. The new varieties are All Head Select, an early selection from the All Head Early variety; Marion Market, a round head variety selected from Copenhagen Market; and Globe, a selection from the popular variety Glory of Enkhuizen. Work on this subject has been conducted at the station for many years, and at present the U. S. Department of Agriculture and the National Kraut Packers Association are cooperating

Philippine College of Agriculture.—According to a recent note in the *Philippine Agriculturist*, the College of Agriculture of the University of the Philippines, located at Los Banos, is the only institution in these islands presenting a full curriculum of university grade in agriculture and the agricultural sciences. Graduation from a fully organized high school or the two-year preparatory school of the college is required for admission. A regular course in general tropical agriculture and special two-year courses in animal husbandry and sugar technology are being given, and a similar two-year course in agricultural education is contemplated. Summer sessions are held in April and May with a large attendance, especially of teachers, and short courses in poultry raising are provided as an extension activity. The capacity of the college is 600 students, and with this limit many are turned away each year.

Necrology.—Charles G. Elliott, widely known as an authority on farm land drainage and chief of the drainage investigations of the U. S. Department of Agriculture from 1902 to 1913, died in Washington, D. C., September 14 at the age of 76 years. He was a native of Illinois and a graduate of the University of Illinois, receiving the B. S. degree in 1877 and the C. E. degree in 1892. He was the author of Practical Farm Drainage (1882 and 1908) and Engineering for Land Drainage (1903, revised 1919), as well as of the first Farmers' Bulletins to be issued by this Department on the drainage of farm lands.

J. H. Miller, head of the extension department of the Kansas College from 1905 to 1915 and the following year dean of agricultural extension in the University of Arkansas, died October 27 at the age of 67 years.

EXPERIMENT STATION RECORD

Vol. 55 December, 1926 No. 8

The fortieth convention of the Association of Land-Grant Colleges marked another milestone in the history of this organization. Like the first convention in 1887 it met in the National Capital, and the primary aim of promoting the interests and enhancing the usefulness of the land-grant institutions was still the dominating motive for its continuance as it had been for its formation. In many other respects, however, striking changes have accompanied the passing of the years.

Of the 35 delegates registered in 1887, all have retired from educational work, although two members, Dean Henry of Wisconsin and Director Thorne of Ohio, continue to hold emeritus appointments. Had any of the group of founders returned for the recent meeting they would have found, first of all, that the name of the association, originally the Association of American Agricultural Colleges and Experiment Stations, had been discarded in 1919 and that by a further constitutional amendment just adopted the organization will henceforth be known as the Association of Land-Grant Colleges and Universities. In place of a representation of little more than half of the States and Territories they would have found delegates last month from all of the States, and in not a few cases there were enrolled the president of the institution, the dean of resident instruction, the station and extension directors, the heads of engineering and home economics activities, and other members of the staffs, swelling the aggregate attendance, including visitors, to a number fully ten times that which assembled 40 years ago. On the other hand, instead of open meetings and unrestricted participation by all delegates in the proceedings, they would have encountered a plan of organization whereby legislative matters are decided by an executive body, composed only of the institutional executives or their representatives, behind closed doors.

More striking, however, than the alterations in name or personnel or procedure have been the changes in outlook and opportunity. The first convention brought together a group of isolated and relatively small and struggling institutions. Home economics was then an unknown term, and some colleges were even without an agricultural student, whereas one of the opening papers of the 1926

convention dealt with the problem of limiting student enrollment. The immediate occasion of organization was the passage of the Hatch Act and the resulting inauguration of organized experimental work in many of the States. The 1926 meetings had behind them a record of nearly 40 years under that legislation and of 20 years of substantial achievement in research under the Adams Act, as well as of a year's auspicious progress in the enlargement of activities under the Purnell legislation. In 1887 contacts between the colleges and the farmers were well-nigh nonexistent; in the interval there had been put into operation the most comprehensive system of extension which has ever been devised and making, as is often said, the campus limits of each institution the borders of the State.

All these changes and many others for which no enumeration is attempted have brought about a relative stabilizing of the association. No longer is the land-grant college system a pioneer venture, but a thoroughly established and well-recognized agency of acknowledged standing and influence. This is reflected in the convention program, which is becoming more or less standardized, and in a harmony of views and viewpoints and an absence of serious controversial issues. This attitude seemed especially noticeable in the 1926 convention, which apparently had before it comparatively little in the way of new problems and few differences of opinion on those which were pending.

These statements do not mean that the association has become reactionary or even stationary. Its outlook as repeatedly revealed is still forward looking and progressive. Little of reminiscence was heard except in the report of the bibliographer, Dr. A. C. True, who utilized the opportunity to present a thoroughgoing review of the legislative history of the passage of the Hatch Act. The general topic of discussion as announced in the program was The Responsibilities of the Land-Grant Institutions in Adjustment of the Agricultural Industry to New Economic Conditions. In the consideration of this question, there was frank appreciation of the many unsolved problems ahead, the perplexities of the existing agricultural situation, and the responsibilities of the land-grant colleges for adequate leadership in the days to come.

The convention was held from November 16 to 18, 1926, with an afternoon and two morning general sessions in addition to the usual number of meetings of sections and divisions and of the executive body. There was also an informal assembly of liberal arts representatives looking toward the establishment of a liberal arts section, and the usual dinners and luncheons of the various groups under what is fast becoming a well-established and much-appreciated custom.

The number of organizations meeting at substantially the same time as the association was somewhat larger than at the last Washington gathering in 1924. The first general session was held jointly with the National Association of State Universities. During the week there were the customary annual meetings of the American Association for the Advancement of Agricultural Teaching, the American Association of Soil Survey Workers, and the American Society of Agronomy, and a little earlier that of the American Country Life Association. One innovation which was tried was that of postponing the two-day program of the American Society of Agronomy until the last day of the association instead of beginning on the day preceding its meetings. This change caused overlapping only with a single general session instead of with the congested opening program of the association and its subdivisions, and to this extent seemed to be a decided advantage.

The joint meeting with the National Association of State Universities was devoted to a discussion of the problem of the separate State university and the separate land-grant college in the same State, the principal participants being President W. A. Jessup of the State University of Iowa, E. C. Elliott of Purdue University, and K. L. Butterfield of the Michigan State College. Naturally no complete agreement in views was reached as to this puzzling and perennial problem, bnt there was evident more or less community of belief that in some way both the State college and the State university should be articulated into a single State educational system, that the capacity taxing enrollments of recent years had rendered the situation much easier of solution, and that in the absence of a single board of control much might be expected from joint conferences which would serve to bring out more definitely the precise fields which the institutions felt they should respectively occupy.

The annnal address of the president, Dean E. A. Burnett of Nebraska, was entitled The Responsibility of the Land-Grant Institutions in Promoting a Sound and Forward-Looking Agricultural Policy for the United States. Dean Burnett referred to the wide acceptance of these institutions as the great fact-finding agencies in the field of agricultural production which they had originally cultivated, and believed that a similar responsibility now rested upon them as regards the economic and social problems, which have now become of outstanding importance to the agricultural industry. He reviewed the economic conditions since the World War in some detail, and concluded from a discussion of suggested remedies that the economic policy of the Nation should have as much regard for agriculture as for other industries and that the solution of the farm problem would come as a result of additional fundamental studies,

in which the land-grant colleges and related agencies should actively engage.

The address of the Secretary of Agriculture drew attention to the remarkable contribution to breadth of educational view which the land-grant colleges have made in their enlargement of the subject matter presented in institutions of higher learning. Particularly has this been the case in emphasizing the application of the natural sciences to the everyday work of the world, and they are now engaged in the application of the social sciences to the same fields. He also pointed out that while the land-grant colleges deal with subjects other than agriculture it is here that they occupy a unique position of responsibility. Not only are they in sympathetic cooperation with the farmer and his source of knowledge and stimulation, but potentially and to a greater and greater degree actually they are the connecting link of understanding between the farm and the city, between the mutually dependent interests of agriculture and urban industry.

In discussing the agricultural situation the Secretary expressed his conviction that cooperation through federated commodity organizations offers the best available single means for increasing the efficiency of production and marketing and of stabilizing agriculture on a higher plane. He referred briefly to the work of the department under the cooperative marketing act of July 2, 1926, and emphasized the need of intensive, thorough, and widespread educational effort to promote the cooperative marketing movement.

In resident teaching, the Secretary advocated an effort to develop the rural point of view, so that it may be more serviceable to agriculture and rural life. Both those who intend to enter upon agriculture as a career, as well as those who are planning to engage in other occupations, should have such a broad and sympathetic grasp of rural problems as to be able to assume leadership in presenting this viewpoint to the Nation as a whole. Attention was called to the importance of not neglecting cultural subjects, and he commended the proposed general survey of the land-grant colleges under the auspices of the association.

On the side of research, the activity in home economics and agricultural economics investigations following the passage of the Purnell Act was regarded as the outstanding development of the year. An additional number of trained investigators for home economics and more complete cooperation and coordination of work in agricultural economics were referred to as among the needs which have been revealed. Regarding the field of economics, he stated that "perhaps it is too early to expect very definite contributions, but it seems to me important to be so headed in our investigation that the results will fit together, be comparable or supplementary, and thus

give a broad basis for generalizations which will be more definite and reliable than anything we have had before."

In conclusion, Secretary Jardine recurred to the need of keeping constantly in mind what he had previously characterized as a "most significant contribution to modern educational practice," the organization of the work of the land-grant colleges into research, teaching, and extension, and to their interrelations and interdependence. "No one of these," he declared, "stands or cau stand alone. The research worker needs to have a vision of the practical needs of the farmers. The teacher of students on the campus needs to realize constantly his indebtedness to the research worker for the facts which he is presenting, and to keep in mind at the same time that the young men and women whom he is instructing are the potential leaders of American agricultural and rural life. The extension worker must not fail to recognize the constant need of new information and a freshly trained personnel. It is only through constant cooperation of these three agencies that we shall attain the ends for which land-grant education was established—better educated men and women on the farms and in the rural communities, a more prosperous agriculture, a more fruitful and satisfying rural culture."

The recent return to this country of two members of the association from extended surveys under the auspices of the International Education Board of agricultural education and research abroad afforded opportunity for a presentation of first-hand observations of conditions in Europe and the Orient. The European situation was described by Dean A. R. Mann, who found many variations and wide contrasts difficult of generalized characterization, but from which he summarized the following as outstanding impressions:

"On the negative side it may be said that the world is to-day losing much of the best efforts and potential productivity of the older generation of scientists in central Europe as a result of financial poverty. Serious as this is for the present, it is perhaps more serious for the future in the discouragement and loss of young men who should be in preparation to replace the present workers.

"On the positive side one witnesses a sifting process in the countries which have suffered most. The unhopeful outlook and low salaries are driving from the staffs of the higher institutions all but those who have a passion for education and scientific work, and whom no discouragements or personal sacrifices can divert from their purposes.

"Again, the creation of many new States has given an impetus to general education and to agricultural education and research as a basic necessity of the new democracies, which spells large advance in

these countries. In all countries the long food deprivations of the people have accentuated the importance of their agricultural institutions. In total, it would appear that greater appropriations, manyfold, have gone into the development of facilities for agricultural education and research in the last 10 years than in any other similar period in the history of Europe.

"With the rise of many new institutions, the preparation of staffs to man them assumes major importance; one is impressed with the attention being given to this matter.

"Finally, the interruption of publications and of intercourse among scientists during the war and the years immediately following has created a new eagerness for international contact and association among workers. There is a hunger for fellowship; there is a new need for comradeship; there is a new opportunity to contribute to world tranquility and amity, which have their foundations in understanding, in sympathy which springs from acquaintance, and in the intellectual integration of the nations."

The observations of Dean H. L. Russell in Hawaii, the Philippines, Japan, China, Java, Siam, Australia, and New Zealand covered an even greater range of extremes as to progress. The importance ascribed to research along specialized lines and its liberal support by private interests in Java and Hawaii, the high standards reached and maintained in Japan, and the awakening interest in agricultural education in China and Australasia despite the serious handicaps of instability of political conditions on the one hand and the pioneer stage of agriculture on the other were among the leading points which he emphasized.

In a brief address by President Butterfield, the aims of the American Country Life Association were explained, and announcement was made of the 1927 convention of that association at East Lansing, Mich., with its central theme The Relationship between Economic and Social Factors. This convention was depicted as of unusual interest because of the projected meeting with it, probably early in August, of the Second International Country Life Conference.

The report of the committee on instruction in agriculture, home economics, and mechanic arts, presented as usual at the closing general session, dealt with a study of methods of teaching in land-grant colleges where subject matter is dealt with in the form of problems, and was based on personal conferences with about 240 teachers in 22 institutions. This study indicated that progress is being made in college courses in these subjects, and that teachers in general are becoming better acquainted with and more interested in the newer developments in teaching methods. The committee felt, however, that greater attention could still be given to the matter, and as a means to this end recommended that the use of the problem method

be extended and that encouragement be given to periodic meetings and conferences for professional improvement, closer contacts with departments of education, better acquaintance with the latest books on teaching methods, and more definite recognition of good teaching.

The presidency of the association was bestowed upon President H. A. Morgan of Tennessee. For the vice presidency, Miss Martha Van Rensselaer was selected, thereby becoming the first woman to hold a general office in the association. Another deviation from a custom of long standing took place as regards the office of secretary-treasurer, held continuously by Dean J. L. Hills since 1904. Director S. B. Haskell, assistant secretary and acting secretary-treasurer during the convention, succeeded Dean Hills as secretary, with the latter retaining the treasurership. A vacancy on the executive committee resulting from the withdrawal from the association of Dr. A. F. Woods was filled by the election of President C. A. Lory of Colorado. The policy of filling committee vacancies by the selection of new members rather than by reappointments was again quite largely followed. A complete list of these appointments is given on page 798.

Decision as to the time and place of meeting of the 1927 convention was, as usual, left with the executive committee. A discussion of the matter indicated, however, the possibility of departure from the policy adopted in 1922 for the meeting in alternate years in Chicago by the substitution next year of some point farther west and a time somewhat earlier in the year than November.

From the point of view of research, the convention was considerably less noteworthy than that of 1925, in which the recent passage of the Purnell Act was almost a dominating influence. None the less, a full and varied program covering two sessions was offered by the section on agriculture, a summary of which it is hoped to present in some detail in these columns in a later issue. Numerous references were also made to research matters in the general sessions, some of which have already been referred to, and there were many indications that the subject was still actively in men's minds and thoughts. Rather surprisingly, the section on home economics spent its time almost wholly on instruction and extension themes, including a discussion of child care and training, its consideration of research being confined to progress reports of the national committees on studies of rural home management and vitamins in relation to human nutrition. Admitting the limitations of even a two-day program and the importance of the subjects which received attention, it would seem that the experiences of the first year of organized research for so many home economics departments should have revealed numerous administrative problems, the discussion of which would have been

peculiarly opportune and appropriate. Some of these, in fact, might readily have been incorporated into a program dealing with instruction, among them the serious need referred to by several speakers elsewhere in the convention of the adequate preparation of prospective research workers. Doubtless larger provision along some of these lines will be made in the next home economics program.

Another matter of some regret is that so little opportunity was available for the discussion of the various papers and reports dealing with agricultural research. An interchange of views upon many of the questions raised might have been very profitable, yet the fullness of the program rendered this virtually impossible, and as a matter of fact practically no comment from the floor was attempted. This condition has frequently prevailed to a greater or lesser extent in recent years, and can hardly be attributed to a lack of interest or of understanding.

Whatever the cause, the situation has unfortunate aspects. The distinctive characteristic of the association as apart from other groups of workers in agricultural science is the bringing together of administrative heads for a consideration of administrative matters. Much of conference and personal contact, of course, goes on outside the meetings, but the experiment might well be tried of additional provision on the program for fuller discussions of research problems through small round-table groups and in the convention as a whole. When the founding of the association following the passage of the Hatch Act is recalled, with its predominating incentive indicated in the original constitution as "the consideration and discussion of all questions pertaining to the successful progress and administration of the colleges and experiment stations," it is apparent that the interests of research are entitled to a large place in the association program and policies. Much has been and is being done in this direction, but it may be questioned whether in the developments in recent years their full importance and needs have invariably been thoroughly realized and provided for.

Even though some of the criticism along this line may fairly rest upon the 1926 convention, it was an interesting gathering, with much of concrete accomplishment to its credit. The proceedings as a whole were characterized especially by earnest consideration of the economic and sociological conditions of farming and rural life and of ways in which the land-grant institutions may aid in the adjustment of agriculture to these conditions. Some important questions were raised as regards the administration of research, and the way was opened for their more extended consideration at a later date. The distinct trend toward more active cooperation and coordination of effort, especially in research, was perhaps the outstanding development of the meetings.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Colloid chemistry, theoretical and applied.—I, Theory and methods, edited by J. ALEXANDER (*New York: Chem. Catalog Co., 1926, vol. 1, pp. 974, figs. 338*).—This is the first of a series of three volumes on colloid chemistry comprising papers by many authors from this and foreign countries. The present volume consists of 60 papers dealing with various phases of the theory and methods of colloid chemistry. The subsequent volumes are to deal with biology and medicine and technology.

Chemistry applied to home and community, P. G. BEERY (*Philadelphia and London: J. B. Lippincott Co., 1926, 2. ed., rev., pp. XVI+534, figs. 85*).—A revision of the volume previously noted (E. S. R., 49, p. 801).

Organic syntheses, VI, edited by H. GILMAN ET AL. (*New York: John Wiley & Sons; London: Chapman & Hall, 1926, vol. 6, pp. VII+120, figs. 5*).—This continuation of the series previously noted (E. S. R., 54, p. 707) contains directions for the preparation of 30 organic compounds, additions and corrections for the preceding volumes, later references to preparations previously described, a continuation of the subject index, and a cumulative author index.

Casein, its preparation, chemistry, and technical utilization, E. L. TAGUE (*New York: D. Van Nostrand Co., 1926, pp. V+218, figs. 13*).—A compilation of information on the chemistry, manufacture, and industrial uses of casein. A list of patents involving casein and a bibliography of 267 references are appended.

The influence of hydrogen ion concentration and of temperature on the hydrolytic scission of casein, D. C. CARPENTER (*Jour. Biol. Chem., 67 (1926), No. 3, pp. 647–658, figs. 2*).—Using the trichloroacetic acid method of Hiller and Van Slyke (E. S. R., 48, p. 109) and the Sörensen formol titration method, the author has determined the extent of hydrolysis of a 1 per cent solution of pure casein over pH ranges of 1 to 3 and 6 to 12, for temperatures of 5, 25, 40, and 60° C., and for hydrolysis periods of 3 and 6 days.

At temperatures above 5° the hydrolysis on the acid side of the isoelectric point of casein appeared to follow a reaction of the first order at a given pH value and to bear a simple relationship to the H-ion concentration. On the alkaline side the relationship was more complex. The hydrolysis curve indicated the presence of two types of protein, an easily hydrolyzable one existing above pH 9 and one not so easily hydrolyzed existing below pH 9. At 5° no measurable hydrolysis occurred in 6 days except at pH values greater than 10.

It is concluded that "casein may be handled in 1 per cent solutions without undergoing hydrolytic scission in acid solutions between pH 1 and 3 or in solutions of alkalies between pH 6 and 10, provided the temperature be kept in the vicinity of 5°. At 25° 1 per cent solutions of casein in alkali at pH 7.0 hydrolyze about 0.15 per cent per day and in acid at pH 3.0 hydrolyze about 0.08 per cent per day. Obviously, the pasteurization of milk or the warming

of milk or casein solutions from which unhydrolized casein is to be later prepared is to be avoided."

Animal and vegetable fats and oils, W. L. Austin and H. J. Zimmerman (*Washington: [U. S.] Bur. of the Census, 1926, pp. 16*).—This continues for 1924 and 1925 the statistical reports on the production, consumption, imports, exports, and stocks of animal and vegetable fats and oils in the United States (E. S. R., 54, p. 307).

The composition of pectin: A preliminary report on the determination of galacturonic acid in pectin, W. H. Dore (*Jour. Amer. Chem. Soc., 48 (1926), No. 1, pp. 232–236*).—Data are given on the content of galacturonic acid and furfural in several pectin preparations from beets. No simple relationship appeared to exist between the content of the two substances. The significance of this is discussed with reference to the proposed hexa-ring structure of pectin substances.

The forms of lactic acid produced by pure and mixed cultures of bacteria, C. S. Pederson, W. H. Peterson, and E. B. Fred (*Jour. Biol. Chem., 68 (1926), No. 1, pp. 151–164, fig. 1*).—The general assumption that an animal or plant cell can produce but one form of lactic acid has been disproved in the studies reported in this paper. "In pure cultures bacteria may produce dextro or levo lactic acid almost exclusively. When grown in mixed cultures with an organism which does not produce lactic acid, large quantities of the opposite enantiomorph may be produced. It is possible that both forms of acid are produced by all lactic acid bacteria. In some cases the production of the two forms is nearly equal, while in other cases the point of equilibrium is near 100 per cent production of one of the enantiomorphs."

Solubility and crystallization data for active and inactive zinc lactate are included.

Studies on the stability of evaporated milk during sterilization, with reference to the hydrogen ion concentration, alcohol test, and the addition of specific buffers, A. G. Benton and H. G. Albery (*Jour. Biol. Chem., 68 (1926), No. 2, pp. 251–263, figs. 6*).—Typical data are reported from a study of the factors influencing the stability of evaporated milk in the sterilizer, including the H-ion concentration of the milk, the addition of buffer solutions, and the property responsible for the alcohol test.

Following the observation that milk from different cows in the same herd varied in the alcohol test, a study was made at almost daily intervals for nearly a month of the milk of a single grade Holstein cow in the second month of her third lactation. The original milk was analyzed for total solids, H-ion concentration, alcohol test, and coagulation time, and the last three determinations were repeated after treatment of the milk with borate or citrate solutions added in different amounts. In the original milk the total solids varied from 11.49 to 12.93 per cent, the H-ion concentration from pH 6.48 to 6.6, and the coagulation time from 4 to 24 minutes. In the buffer tests satisfactory results were obtained only when the milk was rendered fairly negative to the alcohol test, i. e., when there was a barely perceptible precipitate with equal quantities of milk and 75 per cent alcohol and none with 70 per cent alcohol. There appeared to be no particular pH to which the milk could be arbitrarily adjusted.

Further tests conducted on mixed samples from 2 Jersey and 2 Holstein cows, all giving a positive alcohol test, are reported, showing the effect upon the coagulation time and pH value of the milk of additions of various buffer solutions. These confirm the conclusions drawn from the first series that the optimum lies at or near the point at which the milk is positive to 75 per

cent alcohol and negative to 70 per cent. This optimum is considered to be the resultant of several variables, including pH and salt balance and an expression of the colloidal peculiarity of the particular sample. It is emphasized that "each sample, whether mixed or from a single cow, must be regarded as a separate colloidal system. Such experimental controls as are necessary must be run on the sample in question, as results obtained from any other sample, even though from the same source at a subsequent milking, can not be assumed to be comparable."

Distribution of volatile flavor in grapes and grape juices, J. W. SALE and J. B. WILSON (*Jour. Agr. Research* [*U. S.*], *33* (*1926*), *No. 4, pp. 301–310*).—The work of Power and Chesnut (E. S. R., 48, p. 413) and of Scott (E. S. R., 50, p. 204) on the methyl anthranilate content of grapes has been extended to quantitative determinations of the anthranilic acid ester, total esters, and total volatile acids in the skins, pulp, and juice of a large number of varieties of grapes and in commercial grape juices.

The method adopted for the anthranilic acid ester determination consisted essentially in distilling the sample with steam, diazotizing the distillate, destroying the excess nitrous acid after diazotization with a saturated solution of hydrazine sulfate, adding a 5 per cent solution of sodium-α-naphthol-2-sulfonate, followed by a 25 per cent solution of sodium carbonate, and comparing the color developed (light pink to deep red) with a suitable standard or set of standards.

The anthranilic acid ester in 84 samples of whole grapes representing about 55 varieties varied from 0 in the fruit of *Vitis vinifera* to 3.8 mg. per kilogram. The volatile esters and volatile acids in 50 samples representing about 34 varieties ranged from 6 to 366 and from 3 to 121 mg. per kilogram, respectively. The volatile material was not confined entirely to the skin, but was present in considerable amounts in the pulp and to nearly as great an extent in the pomace as in the expressed juice. Juice which had been stored for some time contained less of the ester than fresh juice. The content of anthranilic acid ester in 14 samples of commercial bottled grape juices varied from 0 to 1.35 mg. per liter and of the volatile esters in 8 of the samples from 5 to 20 mg. per liter.

It is concluded that the content of anthranilic acid ester and total volatile esters is a true measure of the intensity of aroma in grapes and grape juices, and that the determination of anthranilic acid ester may be of value in identifying species of grapes.

Antirachitic substances.—III, The catalytic formation of an antirachitic cholesterol derivative, C. E. BILLS (*Jour. Biol. Chem.*, *67* (*1926*), *No. 3, pp. 753–758*).—In this continuation of the series of studies previously noted (E. S. R., 55, p. 308), it is reported that when a solution of cholesterol dissolved in xylene, toluene, benzene, or carbon tetrachloride is refluxed with activated floridin (a fuller's earth from northern Florida possessing marked catalytic properties) fluorescent and resinous products are formed, one of which possesses antirachitic properties. No catalysis took place when the cholesterol was dissolved in ethyl acetate, ethyl alcohol, *n*-propyl alcohol, or isobutyl alcohol.

Studies on the chemical nature of vitamin A, J. C. DRUMMOND, H. J. CHANNON, and K. H. COWARD (*Biochem. Jour.*, *19* (*1925*), *No. 6, pp. 1047–1067*).—In this paper the authors review in considerable detail their as yet unsuccessful attempts to isolate and determine the chemical nature of vitamin A, and in so doing refute the claims of Takahashi and his associates (E. S. R., 55, p. 593) of isolation of the vitamin in pure condition.

Further evidence was obtained that vitamin A may be concentrated without loss in the unsaponifiable fraction of cod-liver oil, provided certain precautions are taken to prevent oxidation. The concentrate (and consequently the vitamin) contains no detectable traces of iodine or nitrogen. About half of the unsaponifiable matter is cholesterol, which may be removed quantitatively without loss of vitamin activity. Distillation in superheated steam in an atmosphere of nitrogen was found not to destroy the activity of the vitamin, which is volatile in the steam, but the method did not prove satisfactory for the separation of the vitamin. On distilling the cholesterol-free residue in a high vacuum, the vitamin was found chiefly in the fraction boiling at from 180 to 220° C. at from 2 to 3 mm. This fraction consisted of one or more unsaturated alcohols. In the other fractions were identified the unsaturated hydrocarbon spinacene and a saturated solid alcohol melting at 60°, both without vitamin A action.

The refutation of the claims of Takahashi is based upon a comparison of the chemical and physical properties of biosterin with the admittedly impure fractions obtained in the present investigation.

A study of some biochemical colour tests.—III, Colour reactions associated with vitamin A, W. R. FEARON (*Biochem. Jour., 19 (1925), No. 6, pp. 888–895, fig. 1*).—The series of studies previously noted (E. S. R., 45, p. 110) has been extended to an examination of the sulfuric acid test for the detection of vitamin A as described by Drummond and Watson (E. S. R., 48, p. 758).

A trial of various solvents and condensing agents led to the selection as the most suitable solvent of petroleum ether, B. P. 40 to 60° C., thoroughly dried by washing three times with one-third its volume of pure concentrated sulfuric acid, and as condensing agent phosphorus pentoxide. For the qualitative test 1 gm. of phosphorus pentoxide is added to 5 cc. of the oil, either undiluted or dissolved in dry petroleum ether in a perfectly dry tube, or a drop of the oil is allowed to fall on a small pile of phosphorus pentoxide on a dry filter paper. In either case a purple color develops if the oil is positive to the original Drummond test. On separating the pigment the residue no longer has growth-promoting properties, showing that the vitamin has entered into the formation of the pigment. The pigment itself, however, was found to be inactive, and the vitamin could not be recovered from the products of hydrolysis of the pigment.

Another color test for vitamin A is described. This consists in placing 1 or 2 drops of the oil, or a dry ethereal solution of the substance to be tested, in a dry 10- or 25-cc. flask, and adding a few dry crystals of pyrogallol and 5 cc. of a 12 per cent solution of trichloroacetic acid in dry petroleum ether. On shaking the flask a bluish pink color develops, which changes to a deep rose and reaches its maximum intensity in from 15 to 20 minutes. This test is given by all substances reacting to the original or modified Drummond test. Aerated oils, irradiated cholesterol, and nonirradiated and irradiated hardened fats do not give the test.

Potentiometric titrations, I. M. KOLTHOFF and N. H. FURMAN (*New York: John Wiley & Sons; London: Chapman & Hall, 1926, pp. XII+345, figs. 45*).—This monograph deals with the fundamental principles and practical applications of potentiometric titrations, in which the end point is detected by measuring the change in potential of a suitable electrode during the titration, as distinguished from conductometric titrations in which the end point is detected by measuring the change of electrical conductance during the titration. The section on practical applications is divided into two parts, the first consisting of a general description of the technique of potentiometric titrations and the second of special determinations, including a chapter on oxidation-reduction reactions.

Methods for determining the replaceable bases of soils, either in the presence or absence of alkali salts, P. S. Burgess and J. F. Breazeale (*Arizona Sta. Tech. Bul. 9 (1926), pp. 187–207, figs. 4*).—Following a theoretical discussion of base replacement in the soil and its importance in soil economy, particularly in irrigation agriculture and in the reclamation of alkali lands, improved methods are described for the quantitative determination of replaceable bases in acid, neutral, and calcareous soils.

Three objections to the use of ammonium chloride for such determinations are given: (1) The large amount of the salt that must be removed before the final determination is made, (2) the solubility of calcium carbonate and to a lesser degree magnesium carbonate in solutions of ammonium chloride, and (3) the solubility in ammonium chloride of organic matter, particularly from alkaline soils. As a substitute for ammonium chloride a tenth normal solution of barium chloride is recommended. The method as applicable to soils free from black alkali is essentially as follows:

A 500-gm. sample of air-dry soil is leached in a glass percolation tube with N/10 $BaCl_2$ until free from replaceable calcium, from 700 to 2,000 cc. being required. The percolate is made up to definite volume with distilled water and filtered if necessary through a porcelain pressure filter. A 200-cc. aliquot is placed in a 250-cc. graduated flask, and to it are added in the cold 4 or 5 drops of concentrated acetic acid and 20 cc. of sodium chromate solution (175 gm. $Na_2CrO_4 . 10H_2O$ per liter) with sufficient water to make up to volume. The mixture is thoroughly shaken and allowed to stand overnight to clear, after which calcium and magnesium are determined either by the soap-titration or the standard methods, the technique for both of which is described. Sodium and potassium are determined by placing a 100-cc. aliquot of the original barium chloride percolate in a porcelain evaporating dish, acidifying it slightly with hydrochloric acid, and adding 5 cc. or more of a 14 per cent solution of ammonium sulfate. After evaporating the solution to dryness on a water bath, drying the residue in the oven, and driving off the excess of ammonium salts by heating to dull redness in the electric muffle, the residue is taken up in dilute hydrochloric acid, digested on the water bath for an hour or more, filtered, and the content of sodium and potassium determined by the Hilgard method. Slight modifications of the method are outlined for white alkali soils carrying soluble salts, heavy soils, and acid soils. For black alkali soils a two-tube percolation method involving the analysis for calcium only has been developed as follows:

One 500-gm. sample of the soil is percolated with N/10$BaCl_2$ until the soil bases are all replaced and another with N/10 $CaCl_2$ until no more calcium is being fixed by the soil. The second tube is leached with water until all of the calcium chloride solution is removed (the leaching water being discarded) and then with N/10 $BaCl_2$ until all of the calcium has been replaced by barium. The three solutions are finally titrated for combined calcium and magnesium by the soap solution method, the first representing the total replaceable calcium in the soil, the second the calcium equivalent of both sodium carbonate and sodium zeolite originally present in the soil, and the third the replaceable calcium of the soil together with the calcium equivalent of the sodium derived from the sodium zeolite originally present in the soil.

Data are given illustrating the development and application of the methods outlined.

Methods for the determination of replaceable bases in soils, P. S. Burgess and J. F. Breazeale (*Science, 64 (1926), No. 1646, pp. 69, 70*).—A brief description, without experimental data, of the methods described above.

A colour reaction for disulphides, E. Walker (*Biochem. Jour., 19 (1925), No. 6, pp. 1082–1084*).—The test is a modification of the nitroprusside reaction for the sulfhydryl group, a solution of potassium (or sodium) cyanide being used instead of ammonia or other alkali. On adding a few drops of 5 per cent aqueous sodium nitroprusside, followed by from 3 to 5 drops of 10 per cent aqueous potassium cyanide to a solution containing a disulfide, a deep magenta color develops immediately if the disulfide is present in high concentration and a light color after a slight delay if more dilute. The limit of sensitivity is said to be 1 : 10,000. The mechanism of the reaction is thought to be the reduction of the disulfide to the sulfhydryl grouping by the cyanide.

Analysis of proteins, V–VII, R. H. A. Plimmer and J. L. Rosedale (*Biochem. Jour., 19 (1925), No. 6, pp. 1004–1021*).—In continuation of the studies previously noted (E. S. R., 51, p. 712), three papers are presented.

V. *Van Slyke's method of determination of nitrogen distribution* (pp. 1004–1014).—The Van Slyke method of estimating nitrogen was tested by both authors independently on samples of gelatin, hemoglobin, and caseinogen with a view to determining in what part of the technique occur the discrepancies in results noted by various workers. Each step in the technique is discussed in detail, with suggestions for slight changes in manipulation.

The chief source of error was found to be connected with the phosphotungstic acid precipitate, mainly due to incomplete precipitation of the hexone bases by not using a sufficient amount of phosphotungstic acid. This error accumulates in the monoamino acid filtrate and increases the differences due to the monoamino acids alone. It is suggested that the various data be taken to the same submultiple of the total nitrogen (not beyond tenths of a milligram) instead of estimating the amino nitrogen to a higher one.

Another source of error was found to be the loss of ammonia occuring during the evaporation of the solution. This has been overcome by making the determination directly on the solution of the phosphotungstate in dilute sodium hydroxide without removal of the phosphotungstic acid and without evaporation.

VI. *Distribution of nitrogen in the proteins of eggs* (pp. 1015–1019).—Data obtained by the modified Van Slyke method described in the previous paper are reported for the nitrogen distribution in egg yolk, egg white, egg membrane, and ovomucoid. Distinct differences in the composition of the various proteins were obtained. The protein of egg white contained more monoamino nitrogen and less diamino nitrogen than that of egg yolk. Egg membrane contained more diamino nitrogen and histidine than the other proteins. The figures for lysine nitrogen were similar in the four proteins.

VII. *Direct estimation of arginine* (pp. 1020, 1021).—In the proteins used in the two previous studies, the percentage of arginine obtained by direct estimation was found in most cases to be equal to the sum of the results obtained from the diamino and monoamino fractions.

On the separation of histidine and arginine, H. B. Vickery and C. S. Leavenworth (*Jour. Biol. Chem., 68 (1926), No. 2, pp. 225–228*).—The authors have attempted to separate histidine from a mixture of the silver salts of histidine and arginine by the addition of barium hydroxide to a faint alkaline reaction to phenolphthalein, as suggested by A. Kossel and S. Edlbacher.[1] It was found that a large part of the arginine present in such a mixture is precipitated together with the histidine, but it is thought possible that by proper control of the H-ion concentration a separation of the two can be effected.

[1] Hoppe-Seyler's Ztschr. Physiol. Chem., 110 (1920), No. 5–6, pp. 241–244.

Preparation of Fehling's solution for the volumetric determination of reducing sugars, J. H. LANE and L. EYNON (*Jour. Soc. Chem. Indus.. 44 (1925), No. 14, pp. 150T–152T*).—Attention is called to slight errors that may arise in the preparation of Fehling's solution owing to the presence in the copper sulfate crystals of moisture in excess of that of the formula $CuSO_4.5H_2O$. Since the removal of the moisture is not practicable, it is recommended that in the method previously described (E. S. R., 49, p. 310) the titer of the copper sulfate solution be checked by the titration of a standard invert sugar solution and the solution adjusted to a titer corresponding with the tables.

The determination of the freshness of milk [trans. title], A. VOĬTKEVICH (WOJTKIEWICZ) (*Vest. Bakt. Agron. Sta. (Ber. Bact. Agron. Sta. Moskau), No. 24 (1926), pp. 102–112*).—Various methods of determining the freshness of milk have been compared.

Research in pickle fermentation, F. W. TANNER and I. O. EAGLE (*Canning Age, 7 (1926), No. 10, pp. 783–785*).—A chronological review, with bibliography, of the literature on the bacteriology of pickling.

METEOROLOGY

Weather and agriculture [trans. title], A. SCHMAUSS (*Landw. Hefte, No. 7, 2. ed., rev. (1925), pp. 38, figs. 7*).—This, second revised edition of a treatise first published in 1912 (E. S. R., 27, p. 413), points out the need for better general knowledge of the subject, discusses briefly the farmer as a weather observer and the value of his prognostications, and explains the principles of scientific weather forecasting.

Meteorology and agriculture, W. R. BLACK (*Jour. Min. Agr. [Gt. Brit.], 33 (1926), No. 4, pp. 321–331, fig. 1*).—This is a brief general article, dealing with the use of meteorological observations in practical agriculture and agricultural research and describing more particularly the agricultural meteorological service in Great Britain.

Notes on the behaviour of certain plants in relation to the weather, N. L. SILVESTER (*Quart. Jour. Roy. Met. Soc. [London], 52 (1926), No. 217, pp. 15–24; abs. in Sci. Prog. [London], 21 (1926), No. 81, pp. 13, 14*).—Certain correlations between the behavior, principally as regards opening and shutting of the flowers, and the physical state of the air or surface soil at the time of observation, are recorded for the scarlet pimpernel (*Anagallis arvensis*), common daisy (*Bellis perennis*), common chickweed (*Stellaria media*), white or Dutch clover (*Trifolium repens*), dandelion (*Taraxacum officinale*), gentian (*Gentiana pneumonanthe*), common marigold (*Calendula pluvialis*), and blue pimpernel (*A. arvensis coerulea*).

No evidence was secured that the behavior of the plants was connected with subsequent weather. The irregular movements during the day appeared to be due to changes in the various meteorological elements, and at best were simply synchronous with the latter, with a definite lag in many cases. "In the case of the daisy, and of chickweed, there was a close response to the temperature of the surface soil; in the case of these two plants, and of the pimpernel, there was found to be also, above a certain critical temperature, a response to the relative humidity, the flowers closing their petals when the relative humidity exceeded a certain value which was different for each kind of flower."

Weather and sugar cane in Louisiana, I–VIII, W. F. MCDONALD (*Planter and Sugar Manfr., 76 (1926), Nos. 22, pp. 428–430, fig. 1; 23, pp. 449–451, fig. 1; 24, pp. 468–471, figs. 5; 25, pp. 489–492, figs. 2; 26, pp. 509–512, figs. 2; 77 (1926),*

Nos. 1, pp. 8–10; 2, pp. 31, 32; 3, pp. 49–52).—Calling attention to the limited previous study of this subject, data on temperature and rainfall at three stations, New Orleans, Baton Rouge, and Abbeville, on rainfall alone at seven other stations, on sunshine at New Orleans, and statistics of sugar production for a number of years are summarized and discussed from various points of view with the object, particularly, of differentiating weather effects from those due to other possible causes.

One of the most significant indications of the data is that a comparatively dry summer and fall (not of drought intensity) is highly favorable for the cane crop of the succeeding year. "A highly important factor in the decreased yields of the period 1909–1924 has been the more or less persistent tendency toward an excess of rainfall affecting the quality of successive seed crops. Conversely, with comparatively dry seasons for maturing seed and preserving it over winter, as in the period before 1907, the successive crops received the benefit in distinctly improved content and yield of sugar."

The drier winters are, however, followed by increased cane borer infestation and injury.

The hazard from early fall frosts appears to be much less than from late spring frosts. "It appears that, at least in the southern portions of the cane region, a rapid increase in sugar occurs within a short period which falls with considerable regularity in the first half of November, and the idea is advanced that the cane harvest should be delayed as much as may be feasible to secure advantage of this ripening period."

The general conclusion is reached that "black lands that for any reason are not readily improved by practicable and economical winter treatment to dry and warm them for preservation of stubble or fall cane, or to afford early spring planting, . . . should be diverted to other, more profitable uses" than cane culture.

Phenology and its importance, with special reference to the phenology of winter rye in Bavaria, 1917–1923, E. Hiltner (*Die Phänologie und Ihre Bedeutung unter Besonderer Berücksichtigung der Phänol. Beobachtungen am Winterroggen in Bayern während der Jahre 1917–1923. Freising: F. P. Datterer & Co., 1926, pp. 86, pls. 2, figs. 11*).—This article discusses the history, development, and applications of phenological study, and reports in detail the results of observations on the influence of variety, fertilizers, soil, climate, altitude, disease, and other factors on winter rye in Bavaria, with numerous tables and charts. A bibliography of 108 references is given.

[Influence of rainfall on the yield of cotton], E. M. Crowther (In *Report of a Meeting in the Sudan Gezira in Dec., 1925, for the Discussion of . . . Cotton Growing. Khartum: Wellcome Trop. Research Labs., 1926, pp. 22–28, pls. 3*).—Study of this subject during 7 years at the Gezira Research Farm, Sudan, has shown that in a 3-course rotation of lubia-fallow-cotton, high May–June rainfalls have greatly decreased the yield of cotton. With a fallow-cotton and durra-cotton rotation, high July–August or high total rains have tended to increase the yields of cotton. With a lubia-cotton rotation and continuous cotton, high September–October rainfalls have greatly decreased the yield of cotton. It is suggested that heavy early rains depress the yield of 3-course cotton by reducing the available nitrogen supply in the soil.

On the effect of sunshine on wheat yield at Rothamsted, L. H. C. Tippett (*Jour. Agr. Sci. [England], 16 (1926), No. 2, pp. 159–165, figs. 2*).—This is a continuation by the same methods of Fisher's study on the influence of rainfall on the yield of wheat at Rothamsted, previously noted (E. S. R., 53, p. 14), leading to the conclusion that "on the whole sunshine and rainfall are quite comparable in their effect on the wheat yield."

Seasonal sunshine in Great Britain, C. HARDING (*Nature [London], 117 (1926), Nos. 2942, pp. 422, 423; 2952, p. 757*).—The seasonal distribution of sunshine in different parts of Great Britain is summarized on the basis of data from the Book of Normals, published by the Meteorological Office, covering the 35 years 1881–1915. As would be expected, considerable variation in different years and different seasons is shown. In all seasons the least sunshine occurs in the north of Scotland and the most in the English Channel. Five stations in Scotland gave an average annual duration of sunshine of 3.41 hours per day. Three stations in the south of England showed an average of 4.65 hours per day. There was little difference in the averages for the eastern and western districts of England, the average annual duration being 4.19 hours and 4.17 hours per day, respectively.

In a brief note J. B. Phillips raises certain questions as to the accuracy of the averages used, to which the author replies.

Relative humidity and the incidence of forest fires, D. V. NOBLE (*Bul. Amer. Met. Soc., 7 (1926), No. 5, pp. 74–77*).—In this abstract of a paper presented at the Washington meeting of the American Meteorological Society, 1926, a summary is given of a study made on an area of about 4,500 square miles in Minnesota, from which the author draws the conclusion that, "omitting the influence of other possible factors, there is a notable tendency for forest fires to increase in number with a decrease in the relative humidity. The relationship is most marked in the late spring and early fall. In both of these seasons the danger is most excessive with relative humidity below 30 per cent, though the danger may be considered imminent with any condition below 50 per cent. Above that value the fire hazard decreases about in proportion to the increase in relative humidity."

Meteorological statistics (*U. S. Dept. Agr. Yearbook 1925, pp. 1486–1514*).—Tables are given which show monthly normal and mean temperature, monthly and annual normal temperatures, normal and total precipitation, monthly and annual normal precipitation, dates of killing frosts and length of growing season, normal hourly wind velocity, and normal monthly and annual percentages of possible sunshine at selected points in the United States.

Weather of the season, P. E. MILLER (*Minnesota Sta., Morris Substa. Rpt. 1924, pp. 4–7*).—Observations on temperature, precipitation, cloudiness, and general weather and crop conditions at the West Central Substation, Morris, Minn., during 1924 are recorded and briefly discussed.

The total annual rainfall, 26.64 in., was practically normal, but there was a scarcity in May which seriously retarded the growth of hay and pastures. The season was too cold for corn, but very favorable for small grains.

SOILS—FERTILIZERS

Soil survey of Maury County, Tennessee, J. H. AGEE and J. A. KERR (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1923, pp. III+153–175, fig. 1, map 1*).—This survey, made in cooperation with the Tennessee Geological Survey, deals with the soils of an area of 395,520 acres lying partly in the basin or low division and in the Highland Rim or high division of south-central Tennessee. The topography ranges from flat to hilly or broken. The surface drainage is said to be adequate and in places is excessive.

The soils of the county are developed mainly on materials derived from limestone, sandstone, and shale, and are predominantly silty. Including rough stony land and mine pit and dump, 20 soil types of 9 series are mapped, of which Maury silt loam, Baxter gravelly loam, and rough stony land cover 24.4, 14.1, and 10.1 per cent of the area, respectively.

The properties of clays, A. V. BLEININGER (In *Colloid Symposium Monograph*, [*II*], edited by H. N. HOLMES. *New York: Chem. Catalog Co., 1925, vol. 2, pp. 80–98*).—This article deals with aggregate structure, mineral composition and microstructure, fineness of grain, chemical composition, properties of clay suspensions, properties of clay in the plastic and dry states, and the testing of clays.

The colloid chemistry of soils, E. TRUOG (In *Colloid Symposium Monograph*, [*III*], edited by H. N. HOLMES and H. B. WEISER. *New York: Chem. Catalog Co., 1925, vol. 3, pp. 228–240, fig. 1*).—In a contribution from the Wisconsin Experiment Station a brief review is presented of the available knowledge on the colloid chemistry of soils, based largely on work at the station.

Nature of the colloidal soil material, P. L. GILE (In *Colloid Symposium Monograph*, [*III*], edited by H. N. HOLMES and H. B. WEISER. *New York: Chem. Catalog Co., 1925, vol. 3, pp. 216–227, figs. 5*).—In a contribution from the U. S. D. A. Bureau of Soils data are presented which are considered to suggest the nature of the colloidal soil material. Analyses of such materials obtained from 10 different soils are reported, which illustrate the wide variations that may occur in the colloidal material of different soils without taking into account extreme soil types.

It is considered obvious that any theory relating to the nature of the material, based on the constancy of composition, can not be applied to soil colloids in general. However, the colloidal materials of soils in similar climatic regions may be very much alike in composition. No evidence was obtained that a definite compound is the chief constituent of this material. Material brought into solution was no simpler or more definite in composition than the original material, and the same was true of the undecomposed residues.

At least a part of the iron in the colloid seemed to be present as an oxide. Nearly all of the calcium and parts of the magnesium and potassium seemed to be present in a somewhat different condition than the rest of the material.

There seemed to be some slight degree of regularity in the variations of the quantities of the different elements of soil colloids. Magnesium and potassium, for instance, were usually both present in excess of calcium. A fair degree of correspondence was also observed between the relative proportions of silica, iron, and alumina in the colloid and the quantity of lime present. Apparently the quantity of calcium tends to vary with the ratio of silica to alumina and iron and with the combined silica and organic matter.

It was found that the colloidal materials from certain soils vary widely in the degree that they possess certain properties, judging by such determinations as average size of dispersed particles, heat of wetting, swelling, viscosity, volume of floc, and adsorptive capacity. The fact that different colloidal soil materials tend to approximate a continuous set order in a number of diverse determinations is taken to indicate that the different materials are all of the same general nature. The fact that one or another colloid departs from the general order in certain determinations is taken to indicate a characteristic difference in the particular colloid.

A fairly constant relation was found between the contents of silica, alumina, and iron in the different colloids and their properties. The relation between heat of wetting and the ratio of silica to alumina and iron was not exactly the same for all colloids, but tended to be fairly constant.

Data on the constitution of colloidal material are also presented.

The rôle of colloids in soil moisture, G. J. BOUYOUCOS (In *Colloid Symposium Monograph*, [*II*], edited by H. N. HOLMES. *New York: Chem. Catalog Co., 1925, vol. 2, pp. 126–134*).—Studies conducted at the Michigan Experiment

Station are briefly reported, from which the conclusion is drawn that colloids exert a most important, if not the controlling, influence on the water relationship of soils. It is strongly emphasized, however, that the knowledge of these various relationships as influenced by colloids is far from being complete or absolutely definite, but is more of a qualitative nature.

Theory of adsorption and soil gels, N. E. Gordon (In *Colloid Symposium Monograph,* [*II*], edited by H. N. Holmes. *New York: Chem. Catalog Co., 1925, vol. 2, pp. 114–125, figs. 4*).—Data from studies at the University of Maryland are reported, from which the conclusion is drawn that soil acidity results from a chemical equilibrium. "The soil colloids, being an insoluble product in this equilibrium, cause the hydrolysis to take place to a large extent, but in themselves furnish only a slight amount of the acidity in comparison with the other hydrolytic products formed simultaneously with the soil colloid." It was found that dyes can not be used to ascertain the colloid content of soils.

Suction force of soils: A note on the application of this principle in the study of the soil-plant system, J. S. Joffe and H. C. McLean (*Science, 62 (1925), No. 1615, pp. 548–550*).—Data from the New Jersey Experiment Stations on the phenomenon of the suction force of soils are briefly reported.

It is concluded that when the suction force of the soil is greater than the pulling power of the plant wilting must ensue. The factor or factors which influence the pulling power of the plant, such as high or low evaporation intensity, will shift the equilibrium between the suction force of the soil and the pulling power of the plant. The problem of wilting of plants may thus be reduced to a study of the suction force of the soil and the evaporation intensity of the air as it is linked with transpiration. Another possible application of the suction force of the soil is a study of the moisture movement in soil profiles. The authors further draw attention to the utilization of the high suction force of one soil to obtain the solution from a soil with a lower suction force.

The power of soils to absorb water from air, F. J. Alway (In *Colloid Symposium Monograph,* [*III*], edited by H. N. Holmes and H. B. Weiser. *New York: Chem. Catalog Co., 1925, vol. 3, pp. 241–246, figs. 2*).—Studies conducted at the Minnesota Experiment Station are briefly reported which indicated that the ability of soils to absorb water vapor is apparently not yet satisfactorily established as a reliable measure of their colloid content.

[**Soil water, grain ratio, and nutrient uptake**], Densch and Hunnius (*Landw. Vers. Sta., 103 (1924), No. 1–2, pp. 91–102, figs. 2*).—This is a study of the influence of soil water content at different growth periods on crop yield, grain to straw ratio, and nutrient uptake, more particularly as regards phosphoric acid in case of oats.

The utilization of water by plants under field and greenhouse conditions, N. M. Tulaikov (*Soil Sci., 21 (1926), No. 1, pp. 75–91*).—Studies conducted at the Agricultural Experiment Station at Saratov, Russia, on the utilization of water by plants under field and greenhouse conditions are reported. The fact was established that the general character of the utilization of water is very similar under the various conditions, but that the difficulty of such investigation in the field obscures the similarity somewhat.

It was found that larger amounts of moisture are utilized during the first part of the vegetation period in the field than in the greenhouse. The loss of moisture is ascribed to the indirect evaporation of water by the soil alongside the plants in the field, something which does not take place in the greenhouse. Therefore the transpiration coefficients of all the plants in the field are comparatively higher than in the greenhouse during the first part of the vegetation period.

This unavoidable indirect loss of water by the soil during the vegetation period in the field led to the conclusion that the transpiration coefficient in the field is always greater than in the greenhouse. The utilization of water during the growth period of the majority of the early spring crops was not regular, there being specific periods when the plants put forth a greater demand for moisture from the soil. With grain crops this period coincides with the period of heading out and blooming.

The utilization of water by seed plants like corn, sorghum, and buckwheat was more regular, but there were certain periods which were outstanding because of a greater utilization of moisture. Roots and tubers were found to utilize the soil moisture with great regularity during the whole period of their growth.

These results are taken to indicate the necessity of a thorough preparation of the soil in the fall for planting the early spring crops.

Solid acidity of soils [trans. title], A. DE DOMINICIS and S. DOJMI (*Ann. Chim. Appl. [Rome], 15 (1925), No. 5, pp. 183–206; abs. in Chem. Abs., 19 (1925), No. 22, pp. 3555, 3556*).—Studies of a number of soils are reported, of which only one was acid to litmus and none liberated acetic acid from calcium acetate even after washing with water. It is concluded that, provided it is deficient in calcium compounds, a soil can become acid through the fixation of the cation of an electrolyte. The addition of calcium carbonate to soils extracted with hydrochloric acid, and then treated with calcium acetate and washed, inhibited the dissociation and removal of bases on subsequent prolonged washing with water.

The results indicated further that there are two types of basic materials in soils, which are called mobile bases and fixed bases. Mobile bases are for the most part combined with soil colloids, on which they are adsorbed in varying amounts. Fixed bases comprised the basic component of the molecules of the crystalline and colloidal compounds of the soil. They are present in constant and definite proportions, and can not be separated without profound chemical and structural alteration of the soil. The addition of calcium compounds to a soil deficient in mobile bases did not improve the condition of the soil by neutralizing its acidity, but did improve it by coagulating the colloids.

Microbiological studies of frozen soil, A. G. LOCHHEAD (*Canada Expt. Farms, Div. Bact. Rpt. 1924, pp. 12–17*).—Studies are briefly reported which showed that under conditions of frost microbiological activities are suspended in soil with little change in the form of plant nutrients. It is thought that under Canadian winter conditions this quiescent period should be regarded as beneficial rather than otherwise, for although complex organic plant residues are little altered there is no overproduction of nitrates to be leached out during the spring thaw. It was found that, in spite of this seasonal cessation of activity, the numbers of bacteria are not depleted, so that with the advent of spring there is no lack of soil microorganisms.

Azotobacter studies [trans. title], L. NIEMEYER (*Bot. Arch., 7 (1924), No. 5–6, pp. 347–374, figs. 3*).—Studies are reported which showed that the occurrence of Azotobacter in soils depends primarily on ventilation and reaction. A total of 54 per cent of the soils examined contained Azotobacter, as did also the cultivated top layer of 74 per cent of the soils. The limiting reactions for the occurrence of Azotobacter corresponded to pH values of from 5 to 8. All soils containing no Azotobacter had pH values less than 5.5. All drainage waters examined contained Azotobacter with the exception of those from moor soil having a pH value of 4.5.

Data on the morphology and the development of Azotobacter are also included.

The Azotobacter test and the reaction condition of the soil [trans. title], E. J. PETERSEN (*Tidsskr. Planteavl, 31 (1925), No. 2, pp. 246–337, figs. 9*).—Studies are reported which showed that the lowest pH value for the growth of *A. chroococcum* lies in the neighborhood of from 5.8 to 6. Azotobacter was found in a few soil samples having a reaction of around 5.5, and the resting cells of Azotobacter were found to retain their vitality even after remaining for a long time in substrata with reactions below 5.8.

The cultivation of Azotobacter in a nutritive medium having a comparatively low buffer action but permitting a lively growth caused the reaction to vary during the period of growth from pH 7 to pH 6.25. As the Azotobacter became resting cells the pH value again increased. This is taken to indicate that Azotobacter produces carbon dioxide but no other organic acid.

The actual acidity of the soil samples did not directly determine the result of the Azotobacter test. In all cases observed, after suspension in potassium phosphate mannite solution, the pH value of the liquid at the beginning of the Azotobacter test was above the lowest critical pH value for growth. A few soils were found, the pH values in aqueous suspension of which lay considerably below 6 but which showed a positive reaction in the Azotobacter test. The use of different but apparently equally suitable inoculating materials caused variations in acid production and resulting Azotobacter development even in the same soil.

It was found that the nitrate contents of soil samples can influence the results of the Azotobacter tests. When the nitrate content exceeded a definite value the nitrate assimilating bacteria in soils which were originally Azotobacter positive stifled the Azotobacter more or less and caused a nontypical film growth. A film also appeared in Azotobacter-negative soils, containing only a few Azotobacter cells, which was difficult to distinguish from a true Azotobacter film by macroscopic investigations.

The total amount of organic acids formed under the Azotobacter test was found to increase with the lime content of the soil samples. The quantity of bacteria transferred with the inoculation film did not seem to be sufficient for a quantitative nullification of the microbiological differences in the soil samples. The result of the Azotobacter test was therefore found to depend among other things upon the nitrate content, the microflora, and the buffer action of the soil samples.

Correlation coefficients between Azotobacter development and buffer effect for 100 different soils are computed according to three different methods.

Nitrogen fixing organisms and radioactivity [trans. title], E. KAYSER (*Compt. Rend. Acad. Agr. France, 11 (1925), No. 26, pp. 716–719*).—Experiments on the influence of a radioactive mineral containing no nitrogen on the activity of Azotobacter are briefly reported. The results indicate a stimulating influence of this material on nitrogen fixation when used in very small amounts in certain soils. It is concluded that where nitrogen fixation is very high in some soils it may be in part explained by the presence of radioactive compounds.

Experiments with "soilgro," A. G. LOCHHEAD (*Sci. Agr., 6 (1926), No. 6, pp. 210–217, figs. 2*).—Pot and field tests of a so-called bacterial plant food conducted at the Central Experimental Farm, Ottawa, on different crops and vegetables are briefly reported. The results indicate no practical benefit to be derived from the use of this culture.

Soils and fertilizers, N. MAYO (*Fla. Dept. Agr. Quart. Bul., 36 (1926), No. 3, pp. 128*).—Practical information on soils and soil fertility and on the selection and use of fertilizers is pre

Soil fertility investigations, M. J. THOMPSON (*Minnesota Sta., Duluth Substa. Rpt. 1924–1925, pp. 23–30, fig. 1*).—The progress results of experiments on clover utilization, rotation without clover and manure, rate of manuring, commercial fertilizers, garden fertilization, and production on virgin soils are reported.

[Soil fertility studies at the Morris, Minn., Substation], P. E. MILLER (*Minnesota Sta., Morris Substa. Rpt. 1924, pp. 8–21*).—Progress reports are given on experiments with phosphate and manuring rotations, fertilizer tests with alfalfa, rates of manuring, wheat straw and corn stover as fertilizers, and the clover utilization rotation.

The action of the nitrogen content of hot fermented stable manure in pot experiments [trans. title], D. MEYER (*Deut. Landw. Presse, 53 (1926), No. 3, pp. 26, 27, fig. 1*).—Experiments are briefly reported which indicated that in spite of its characteristic properties, hot fermented stable manure showed only small activities as a nitrogenous fertilizer. This is attributed to the fact that the difficultly soluble nitrogenous compounds of the stable manure are not sufficiently broken down during the active decomposition of the organic matter content.

Utility of manure nitrogen in soil [trans. title], C. BARTHEL (*K. Landtbr. Akad. Handl. och Tidskr., 64 (1925), No. 2, pp. 111–121*).—Studies are reported from which the conclusion is drawn that the increase in microorganisms produced by the application of manure has no effect on the microflora of the soil, having an indirect rather than a direct biological action. Only the ammonia content of the manure is nitrified during the first year, and the organic nitrogen is decomposed very slowly. It is also concluded that ammonia is of great importance in the decomposition of cellulose, but that this is an indirect effect of manure.

Nitrogen fixation: A new form of agricultural and military insurance (*U. S. Dept. Agr., Fixed Nitrogen Research Lab., 1926, pp. 14*).—A brief discussion of the subject is given, which refers particularly to processes and developments in the United States.

Some factors affecting the fixation of nitrogen as sodium cyanide, E. W. GUERNSEY, J. Y. YEE, J. M. BRAHAM, and M. S. SHERMAN (*Indus. and Engin. Chem., 18 (1926), No. 3, pp. 243–248, figs. 6*).—Studies conducted by the U. S. D. A. Fixed Nitrogen Research Laboratory on the effect of variations in the quality and proportions of the charge components, concentration of carbon monoxide gas in the nitrogen, temperature, and nitrogen excess on the rate of conversion and on the maximum conversion of sodium carbonate to sodium cyanide by heating a charge of sodium carbonate, carbon, and iron in nitrogen are reported.

It was found that silica in the charge lowers the maximum conversion by making sodium carbonate unavailable for cyanide formation in the ratio of 2 parts of sodium carbonate to 1 of silica. The equilibrium conversion of carbonate to cyanide with nitrogen gas containing 30 per cent carbon monoxide is 04 per cent at 950° C. and with 50 per cent carbon monoxide it is 67 per cent at 1,000°. The cyanide-forming reaction is quite rapid if a large enough excess of nitrogen is used to keep the carbon monoxide concentration low.

In order to minimize the retarding effect of carbon monoxide on cyanide formation, it appears advisable to use a temperature of at least 1,050°. It was found that with increasing temperature the proportions of iron catalyst could be decreased, so that at 1,050° from 1 to 2 per cent of iron is apparently sufficient. The reactivity of metallurgical coke for the formation of sodium cyanide was found to be much less than that of wood charcoal, petroleum coke, coconut charcoal, or lampblack.

Continued treatment of a charge in which the formation of cyanide is completed was found to result in the distillation of material containing much metallic sodium, indicating that sodium cyanide is appreciably dissociated in the vapor phase. Sodium cyanide can therefore not be recovered from a crude charge by distillation.

Comparative fertilizing action of different new urea fertilizers derived from cyanamide [trans. title], C. Brioux and J. Pien (*Compt. Rend. Acad. Agr. France, 12 (1926), No. 7, pp. 195–200; also in Compt. Rend. Acad. Sci. [Paris], 182 (1926), No. 6, pp. 410–412*).—Pot experiments with maize and white mustard to determine the fertilizing value of nitrogenous materials derived from cyanide are briefly reported. The results indicate the importance of preventing the formation of dicyandiamide in nitrogenous fertilizers and of reducing the content of guanylurea to a minimum.

The phosphorite deposits of the Moscow Government [trans. title], A. V. Kazakov (*Trudy Nauch. Inst. Udobr. (Trans. Inst. Fert. [Moscow]), No. 24 (1925), pp. 66, pl. 1, figs. 7*).—A description of these deposits is given, together with analyses of typical samples. They consist of two beds, one averging 0.3 meter and the other from 0.7 to 0.8 meter in thickness. These are separated by a sand layer from 1 to 1.5 meters in thickness. The top bed lies at a depth of only from 2 to 6 meters. It is estimated that the deposit contains about 2,732,000 tons of material, which is easily mined. According to the chemical analyses this material contains from 20 to 27 per cent of phosphoric acid, and will yield a superphosphate containing about 13 per cent of water-soluble phosphoric acid.

The solubility, availability, and value of different forms of phosphoric acid and of fertilizers containing phosphoric acid [trans. title], K. Scharrer and A. Strobel (*Ztschr. Angew. Chem., 38 (1925), Nos. 43, pp. 953–958; 44, pp. 988–992*).—An extensive review of work on the subject is presented.

Determination of easily soluble soil phosphoric acid [trans. title], M. Gerlach and O. Nolte (*Mitt. Deut. Landw. Gesell., 41 (1926), No. 10, pp. 208–211*).—Studies are briefly reported from which the conclusion is drawn that field experiments supplementing pot experiments still offer the safest and surest means for determining to what extent phosphoric acid fertilization is necessary and profitable.

Effect of lime on soil conditions and plant growth in field and pot experiments [trans. title], D. V. Druzhinin (D. W. Droujinin) (*Trudy Nauch. Inst. Udobr. (Trans. Inst. Fert. [Moscow]), No. 31 (1925), pp. 43*).—Studies are reported which showed that the productivity of a series of podsol soils bore a direct relation to their adsorption capacities. The lime requirement of these soils was found to be directly related to the degree of acidity determined by the titration of a hydrochloric acid extract in the presence of phenolphthalein. The action of lime on soil processes in the field was found to be strikingly similar to those observed in pot experiments.

Effects of liming and green manuring on crop yields and on soil supplies of nitrogen and humus, C. A. Mooers (*Tennessee Sta. Bul. 135 (1926), pp. 64, figs. 27*).—The results obtained in two series of experiments, one conducted for 20 years at Knoxville in the eastern part of Tennessee and the other for 16 years at Jackson in the western part, with a rotation of cowpeas and wheat are reported. The two crops were grown annually under various conditions of liming, manuring, and fertilizing in connection with both the turning under and the removal of the cowpea crops.

In the Knoxville experiments there was no indication that liming increased the availability of the soil potash. It had little effect on the cowpea crop

where no potash was applied, but was highly effective on the wheat crop where phosphate was applied. Phosphate produced little increase in the cowpea crops. Four tons per acre of manure applied annually was highly effective in increasing both the cowpea and the wheat crops. More cowpea hay was produced when the manure was applied at the time of soil preparation for the cowpea crop than where the application was delayed until the preparation for the wheat crop.

The yields of cowpeas and wheat were greater on limed than on unlimed soils. The effect of liming throughout the 20-year period was more pronounced on the yields of wheat where the cowpea crops were removed, without return of manure, and where no cowpeas were grown, than elsewhere. Where cowpeas were turned under annually the wheat yields continued to decline slowly for the first 14 years.

The nitrogen content of the soil under all the experimental conditions declined appreciably for the first 10 years, after which there was little change. For a period of between 5 and 8 years after the first liming the soils where cowpeas were turned under contained appreciably less nitrogen than the unlimed soils. A similar but more pronounced result was noticeable for at least 8 years where the cowpea crops were removed. Liming caused little or no waste of soil nitrogen, but it appeared to have accelerated for a time losses of nearly equal magnitude which took place at a more nearly uniform rate where no liming was practiced.

Where the cowpea crops were turned under annually there was a loss of 0.11 per cent of total humus at the end of the 20-year period. Where they were removed annually the loss of humus at the end of the 20-year period was 0.24 per cent, and there was less humus in the soil of the limed than of the unlimed sections. Where the cowpea crops were turned under the limed soils contained slightly more humus.

At the end of the 10-year period there was an average loss of 0.07 per cent of colloidal humus where the cowpea crops were removed, a loss of 0.05 per cent where the cowpea crops were turned under, and a gain of 0.03 per cent where manure was applied. Liming resulted in a lower content of colloidal humus noticeable under all conditions in the earlier years, with a maximum in the neighborhood of the fifth year.

In the Jackson experiments the principal effect of liming was to increase the amount of available soil nitrogen, this stimulation following the law of diminishing returns. Liming with burnt lime was not permanently harmful to the soil, and was therefore concluded to be a justifiable practice.

Experiments at Knoxville with a 5-year rotation of corn, soy beans, wheat, clover, and grass under both limed and unlimed conditions are also reported. The majority of both the wheat and soy bean crops failed to show any increase as the result of liming. On the average the yield of corn was somewhat greater on the limed than on the unlimed soils. Alsike, red, and crimson clovers all responded markedly to liming, with no indication of decreasing the effectiveness of liming throughout the period. The response of crimson clover to liming was less than that of either of the other crops. The nitrogen content of the soil was maintained better under the conditions of the 5-year rotation than where the cowpea crops were turned under every year in the cowpea-wheat rotation. The nitrogen contents of the limed soils were found to be slightly larger each year than those of the unlimed soils.

Peat compost as a fertilizer [trans. title], Z. V. LOGVINOVA (Z. W. LOGWINOWA) (*Trudy Nauch. Inst. Udobr.* (*Trans. Inst. Fert.* [*Moscow*]), *No. 32* (*1926*), *pp. 70, figs. 4*).—Pot and field experiments on the value of peat as a

source of nitrogen and phosphoric acid and on the decomposition of raw phosphate in mixtures of peat with raw phosphate are reported. Samples of two slightly decomposed upland moor peats and of two structureless lowland moor peats in an advanced stage of decomposition were used.

The analyses of the water extracts from the composts showed that the nitrogen of the upland moor peats was mineralized as the result of composting with lime or with lime and ashes. Under the same conditions it was found that the nitrogen of the lowland moor peats was not so extensively mineralized as that of the upland moor peats. Furthermore, the nitrogen of the lowland moor peats was not extensively utilized by plants. On the other hand upland moor peat as a nitrogenous fertilizer increased crop yields from 50 to 80 per cent.

Mixing of upland moor peat with phosphorite resulted in as much as 25 per cent of the total phosphorus content of the latter becoming water soluble. The ability of the upland moor peat to dissolve out the phosphoric acid from phosphorite was also indicated by sand cultures with oats. Preliminary composting of the peat with phosphorite gave no added advantage in this respect. The solubility of the phosphoric acid of the phosphorite increased as the ratio of peat to phosphorite increased.

When mixtures of peat and phosphorite and of peat and ashes were composted separately and later mixed together and inoculated with liquid manure, a complete fertilizer was obtained. Lowland moor peat was unable to increase the solubility of the phosphoric acid of phosphorite.

Sugar cane trash as manure, A. Bonazzi (*Planter and Sugar Manfr., 75 (1925), No. 21, pp. 410–412*).—Studies conducted at the Chaparra Experiment Station in Cuba which referred particularly to the influence of the incorporation of sugar cane trash on the moisture content of soil are reported.

The greatest retention of moisture occurred when the cane leaves were allowed to accumulate on the surface of the soil. Incorporation of the leaves in the soil by plowing or cultivation did not justify the additional expense. Elephant grass failed to bring about any marked retention of moisture.

Denitrification was very active when cane leaves were incorporated with soil. When sodium nitrate was applied the nitrate losses were very large, whereas in soils receiving assimilable carbohydrates, but not nitrate, the formation of a small quantity of nitrate from the natural soil stores of nitrifiable substances was followed by its early disappearance.

The formation of nitrates from tankage in soils containing cane leaves was not cumulative but reached a maximum after 10 days, followed by a rapid disappearance during the second period of incubation.

The results are taken to indicate that cane leaves and trash should not be incorporated in the soil at a time of active nitrate formation in the soil. The most appropriate form of nitrogenous fertilizer for use in these soils is deemed to be the organic.

Adaptability of cachaza as a fertilizer [trans. title], A. Bonazzi and T. C. Green (*Chaparra Agricola, 1 (1924), Nos. 5, pp. 3–11; 6, pp. 3–10*).—Much of the data summarized in the above report is presented in this paper in more detail. While cachaza is apparently an excellent source of humus and ultimately of available nitrogen, it seems that with certain forms of application its decomposition is slow and considerable denitrification of soil nitrates may occur. Apparently its application in dry form to the soil surface without plowing under is best.

Commercial fertilizers, agricultural minerals, 1925, F. Thompson et al. (*Calif. Dept. Agr. Spec. Pub. 61 (1926), pp. 64*).—Guaranties and actual analyses

of 376 samples of fertilizers and fertilizer materials and 74 samples of agricultural minerals, including calcium carbonates, hydrated limes, gypsums, and mineral composts, collected for inspection in California during 1925 are presented, together with a list of fertilizer and agricultural mineral manufacturers and dealers in the State for the fiscal year ended June 30, 1926.

AGRICULTURAL BOTANY

The extent to which weeds modify the transpiration of cereals, A. L. Bakke and H. H. Plagge (*Iowa Sta. Research Bul. 96 (1926), pp. 209–239, figs. 9*).—The results are given of a series of pot cultures in which the growth and competition of wheat, oats, wheat and mustard, and oats and mustard were compared. The number of plants was limited to represent the best field conditions as nearly as possible. Measurements of leaf area were taken at frequent intervals, and the water loss was also determined. The data clearly show that the mustard plants required a large amount of water.

A comparison of the pure and mixed cultures showed that a weed like mustard impairs the crop. The effect is indicated by the fact that a culture of wheat and mustard attained its maximum leaf area later than a culture which contained only wheat, and cultures of oats and mustard attained maximum leaf area later than cultures of oats alone. It was also found that the dry weight produced was cut down in the mixed cultures.

In the course of the experiments it appeared that where oats were grown thickly enough they offered a competition between themselves, and such growth proved a good means for the eradication of weeds. In this respect oats appeared to be better for weed eradication than wheat.

Some further experiments on the relation of light to growth, J. Adams (*Amer. Jour. Bot., 12 (1925), No. 7, pp. 398–412*).—These experiments were undertaken to furnish further information bearing upon statements or deductions in papers previously published, some of which have been noted (E. S. R., 37, p. 15; 52, p. 327).

Under continuous exclusively electrical illumination (voltage 110, wattage 700), castor oil bean completed its life history from seed to seed and produced vigorous plants from seeds ripened under electric light. Flowers developed their natural colors under the same conditions. Plants of wheat, buckwheat, and soy bean under daylight alone grew better than did those under daylight with electric illumination at night; though hemp, wax bean, and sunflower showed a slight increase ascribed to nightly illumination. Under the additional illumination at night, earlier flowering occurred in wheat and sunflower and later flowering in hemp.

As regards height, flowering time, and weight, wheat, flax, hemp, buckwheat, white mustard, soy bean, castor oil bean, and sunflower grown both in the greenhouse and in the open gave as satisfactory results under two hours' exposure at midday as under three hours' exposure during the morning or afternoon.

Greenhouse experiments with Indian corn, flax, hemp, castor oil bean, buckwheat, white mustard, soy bean, and sunflower at different times of the year showed as good a growth under an average exposure to daylight for 568 hours 40 minutes at a mean temperature of 60.8° F. as with an average exposure to light of 499 hours 53 minutes at a mean temperature of 68.2°. Experiments with wheat, buckwheat, white mustard, and flax showed as vigorous growth under a glass screen as did that of a corresponding set in the open.

The conclusion is drawn that experiments on the relation of plants to light, to be of value, must take into account not only the duration of light but also measurements of its intensity, as well as records of the temperature throughout the experimentation.

The effect on plants of the increase and decrease of the period of illumination over that of the normal day period, M. E. Deats (*Amer. Jour. Bot., 12 (1925), No. 7, pp. 384–392, pls. 2*).—Studies are outlined as carried out with dwarf nasturtiums, tomato, and pepper, as affected by different lengths of the daylight period. It is thought probable that the differences in the relative length of day and night may influence the form of plant development by affecting the nitrogen-carbohydrate ratio.

Temperature and anthesis, W. A. Setchell (*Amer. Jour. Bot., 12 (1925), No. 3, pp. 178–188, figs. 4*).—There are at least five successive waves of anthesis in the plant community on the south slope of Mount Tamalpais at about 2,400 ft. altitude. These waves occur in the months when the mean maxima and the mean minima of temperature for the month are approximately 5° C. apart, these conditions, in the case of land plants, agreeing with those found in aquatics. Apparently, the temperature variable is the one controlling anthesis, not the moisture variable or the hours-of-daylight variable. All observations on the aquatic and land plants indicate definite points of critical temperature for anthesis at regular intervals of 5° from 5° to at least 30°.

The elongation of root hairs as affected by light and temperature, R. E. Jeffs (*Amer. Jour. Bot., 12 (1925), No. 9, pp. 577–606, pl. 1, figs. 6*).—The grand period of elongation of the root hair resembles the grand period of growth of plant tissues in general, except that the middle of the curve is more extensively flattened in case of the root hair. There is a gradual increase in the growth rate during the early part of the period and a gradual diminution in rate at the close. A definite inverse relation appears between number of root hairs and rate of growth. There is also a definite relation between root hair elongation and lateral movement.

It is concluded that the effect of temperature upon the rate of growth of tissues is at least in part an effect upon the osmotic pressure and imbibition of the cell colloids, rather than simply an effect upon the rate of chemical reactions within the tissues.

Root-hair elongation in Knop's solution and in tap water, C. H Farr (*Amer. Jour. Bot., 12 (1925), No. 7, pp. 372–383*).—The data, in the consecutive series A–Y as tabulated for the different phases, are discussed.

Investigations on the root habits of plants, J. E. Weaver (*Amer. Jour. Bot., 12 (1925), No. 8, pp. 502–509, figs. 4*).—This account consists chiefly in generalizations arrived at during 10 years.

The great extent of roots in relation to above ground parts is often very striking, as is also the rapidity of root growth. Large amounts of water and nutrients are taken up by such widely spreading roots. Variations in root habit under different climatic conditions are often very pronounced, as also under local environments. Root stratifications due to soil texture are not infrequent. Competition produces pronounced differences in the same field. Considerable progress has been made in a study of the relation of absorbing area to transpiring surface. The large area of a single root is often impressive. Laterals vary greatly with soil. Adaptation of crop plants to new environments, whether by selection or by breeding, like many other problems in plant production, warrants careful study of root relations.

Soil nutrients in relation to vegetation and reproduction, E. J. Kraus (*Amer. Jour. Bot., 12 (1925), No. 8, pp. 510–516*).—"Except in the case of seeds,

some bulbs, tubers, and storage roots, until recently the principal method employed to vary the vegetative and reproductive behavior of plants and to alter the types and quantities of nitrogenous compounds within them was to vary the nitrogenous compounds in the nutrient medium." The more recent methods and some results are discussed. "The comparatively few records which are available relative to sulfur and phosphorus within the plant indicate that relatively large quantities of sulfates and phosphates may also exist or accumulate as reserves within the plant, and that these may be metabolized when a deficit of these substances is created in the nutrient medium. Like nitrogen, sulfur and phosphorus may enter largely into organic combinations."

The effect of selenium compounds upon growth and germination in plants, V. E. Levine (*Amer. Jour. Bot., 12 (1925), No. 2, pp. 82–90*).—The selenium compounds studied when present in concentrations of 0.01 per cent and over are exceedingly inimical to plant germination and growth. The order of diminishing toxicity is selenious acid, selenic acid, sodium selenite, sodium selenate, and potassium selenocyanid. This order is said to agree with that shown in experimentation on animals. Increased growth has been observed with very dilute solutions (0.0001 per cent, 0.001 per cent) of selenium dioxide (selenious acid) and of selenic acid. Selenium compounds are taken up and retained by plants.

The effect of phosphates on respiration, C. J. Lyon (*Jour. Gen. Physiol., 6 (1924), No. 3, pp. 299–306, figs. 4*).—"Phosphate accelerates both aerobic and anaerobic respiration. The acceleration almost disappears when the plant dies (in phosphate solution) but subsequently becomes greater than in life."

Comparative studies on respiration.—XXVIII, The effect of anesthetics on the production of carbon dioxid by wheat under aerobic and anaerobic conditions, A. Karlsen (*Amer. Jour. Bot., 12 (1925), No. 10, pp. 619–624, figs. 4*).—The relation between the aerobic and the anaerobic production of carbon dioxide by organisms has been subjected to quantitative studies by Lyon in the article noted above. The method employed in the present work was the same as that reported in 1918 by Osterhout and referred to as employed in several sections of the present series as previously noted to date (E. S. R., 47, p. 426; 48, p. 727; 52, pp. 516, 626.)

"The effects of ether, benzene, and alcohol on the aerobic and anaerobic production of carbon dioxide by wheat are closely similar. This would seem to indicate that the fundamental processes or the master reactions on which they depend are similar."

Conditions of starch formation in leaves of Abutilon asiaticum G. Don, R. H. Dastur (*Abs. in Indian Sci. Cong. Proc. [Calcutta], 11 (1924), p. 146*).—It was found that starch appears in 20 minutes after exposure to light. Supposedly it is formed earlier but is masked by the layers of epidermal and palisade cells.

Specific water conductivity of the wood in trees with reference to leaf fall in India, R. S. Inamdar and Akshaibar Lal (*Abs. in Indian Sci. Cong. Proc. [Calcutta], 11 (1924), pp. 145, 146*).—From observations outlined, it is concluded that the capacity of the wood for conducting water is greatest just before and at the time of leaf fall, decreasing considerably when the new leaves are fully developed. Deductions are offered.

The inhibition of bud-development as correlated with the osmotic concentration of sap, E. I. Fernald (*Amer. Jour. Bot., 12 (1925), No. 5, pp. 287–305, figs. 15*).—In a study of sap concentrations it was found that the sap of potato sprouts always had a higher concentration than that of the mother

tubers. Tubers having a strong terminal sprout nearly always showed greater sap concentration in the eyes nearest the apex, whereas tubers sprouting irregularly rarely showed a slightly greater concentration in the apical than in the basal eyes. Deviations are noted in certain potato varieties.

Though it is evident that osmotic concentration may be an important factor in inhibition and at times the determining factor, so that it should be considered in experiments on inhibition, it is considered as only one of probably several factors.

The antagonistic influence of hydrogen and calcium ions on the development of Saprolegnia [trans. title], M. F. Liljenshtern (Lilienstern) (*Trudy Leningrad. Obshch. Estest.* (*Trav. Soc. Nat. Leningrad*), *55* (*1925*), *No. 3*, *pp. 3–16*).—The author found that the addition of calcium in certain concentrations neutralized the previously discovered limiting influence of H ions, and thus favored the production and maturing of oogonia. The favoring conditions, so far as ascertained, were 1 to 2 per cent at pH 3.6 and 0.2 per cent at pH 4.6. Higher and lower concentrations were less effective or ineffective.

Hydrogen-ion concentration of certain plant juices, F. M. Andrews (*Ind. Acad. Sci. Proc.*, *40* (*1924*), *pp. 265, 266*).—A considerable number of tests were made to ascertain the H-ion concentration of the cell sap of certain plants, especially of the fruiting parts, this being for the purpose in part of comparing fruits at different stages of maturity. The material investigated, as listed, included *Pyrus malus*, *Citrus sinensis*, *C. grandis*, *Rheum rhaponticum*, *Prunus persica*, *Cucumis sativus*, *Vitis vinifera* [*Zea mays*], *Daucus carota*, *Solanum tuberosum*, *Ipomoea batatas*, and *Allium cepa*.

The influence of hydrogen-ion concentration on the development of the pollen tube of the sweet pea (Lathyrus odoratus), R. A. Brink (*Amer. Jour. Bot.*, *12* (*1925*), *No. 3*, *pp. 149–162*, *figs. 4*).—A method is described whereby the effect of the H-ion concentration on pollen germination and pollen-tube growth in a synthetic medium may be determined, this method involving the control of the very striking toxic effect of such cations as K and Na introduced into the cultures in adjusting the pH.

The penetration of cations into living protoplasm, G. W. Scarth (*Amer. Jour. Bot.*, *12* (*1925*), *No. 3*, *pp. 133–148*, *figs. 3*).—A reaction in the cells of Spirogyra, which is shown to require penetration of the stimulating agent, is used as a criterion of the penetration capacity of the cations. This point is discussed in some detail.

[Studies on plant cell death changes and conservation], I. Clemente (*Landw. Jahrb. Bayern*, *16* (*1926*), *No. 1–3*, *pp. 87–92*, *figs. 5*).—Cell death in plants is always associated with perceptible alterations. Except in case of copper, which gives a blue-green coloration of the cell nucleus, no conclusion is drawn as to the identity of the killing chemical agent. Under artificial conservation employing carbon tetrachloride only slight loss of nutritives occurred, but some acidity was produced.

Plasticity in foliar structure in herbaceous plants [trans. title], V. V. Aleksandrov (Alexandroff) (*Trudy Leningrad. Obshch. Estest.* (*Trav. Soc. Nat. Leningrad*), *55* (*1925*), *No. 3*, *pp. 29–52*, *figs. 55*).—Results with *Helianthus annuus*, *Atriplex hortensis*, and *Carthamus tinctorius* are detailed.

Physiological anatomy of the leaf tips of Gloriosa superba Linn., P. M. Kanga and R. H. Dastur (*Abs. in Indian Sci. Cong. Proc.* [*Calcutta*], *11* (*1924*), *p. 147*).—An account is given of the two types of cells which constitute the motor tissue of the sensitive leaf tips which characterize the climbing organs of *G. superba*. The elongation of the normal cells is due to fall of turgor and the extensibility of the thin cell membranes.

Variations in a member of the genus Fusarium grown in culture for a period of five years, W. H. BURKHOLDER (*Amer. Jour. Bot., 12 (1925), No. 4, pp. 245–253*).—Morphological and physiological changes are described as taking place gradually but pronouncedly when *F. martii phaseoli* is grown in pure culture for a long time.

Some abnormalities in the flower of Cannabis sativa, S. R. KASHYAP (*Abs. in Indian Sci. Cong. Proc. [Calcutta], 11 (1924), p. 144*).—The occurrence of bisexual flowers, normal or more or less modified, and several intermediate forms between stamens and pistil are outlined.

The age-and-area hypothesis with special reference to the flora of tropical America, J. M. GREENMAN (*Amer. Jour. Bot., 12 (1925), No. 3, pp. 189–193, pl. 1*).—The author adds to the discussion which has followed the appearance of Willis' age and area publications (E. S. R., 52, pp. 219, 628).

The geographical distribution of poison sumac (Rhus vernix L.) in North America, J. B. MCNAIR (*Amer. Jour. Bot., 12 (1925), No. 7, pp. 393–397, pl. 1, fig. 1*).—An attempt has been made to determine the geographical distribution of poison sumac (*R. vernix*) by means of the locations from which herbarium specimens were taken, by correspondence, and by the locations where birds were found having seeds of *R. vernix* in their stomachs. It thus appears that this plant is found in Quebec and Ontario, Canada, and in all of our States east of the Mississippi River except Kentucky, Tennessee, and West Virginia, also in the four trans-Mississippi States, Minnesota, Missouri, Louisiana, and Texas. *R. vernix* inhabits preferentially swamps or land inundated at least part of the year.

A table to facilitate correction for undercooling in cryoscopic work, J. A. HARRIS (*Amer. Jour. Bot., 12 (1925), No. 8, pp. 499–501*).—The facility with which the table which is presented may be used is illustrated by examples.

GENETICS

Our present knowledge of heredity (*Philadelphia and London: W. B. Saunders Co., 1925, pp. 250, figs. 43*).—This consists of the following papers given in a series of lectures at the Mayo Foundation and the Universities of Wisconsin, Minnesota, Nebraska, Iowa, and Washington (St. Louis): Heredity: The General Problem and Historical Setting, by W. E. Castle; The Heredity of Sex, by C. E. McClung; The Inheritance of Acquired Characters, by J. A. Detlefsen; Heredity in Relation to Cancer, by M. Slye; The Influence of Heredity on the Occurrence of Cancer, by H. G. Wells; and Eugenics, by M. F. Guyer.

Evolution and genetics, T. H. MORGAN (*Princeton: Univ. Press, 1925, 2. ed., [rev.], pp. IX+211, figs. 77*).—This is essentially a complete revision of A Critique of the Theory of Evolution (E. S. R., 37, p. 578), but greater attention is given to the recent discoveries in genetics and mutation.

An introduction to cytology, L. W. SHARP (*New York and London: McGraw-Hill Book Co., 1926, 2. ed., [rev. and enl.], pp. XIV+581, figs. 210*).—In this revised edition of a work noted earlier (E. S. R., 46, p. 823) recent advances have enabled the author to treat more fully the cytology of hybrids, polyploidy, apomixis, the achromatic figure, the Golgi material, and animal spermatogenesis. "A noteworthy departure will be recognized in the reliance on the Organismal Theory as a fundamental concept; the primary emphasis has been placed upon protoplasm and the organism as a whole rather than upon the cell as such." The bibliography has been greatly augmented.

The cytological bases of heredity [trans. title], B. V. R. DE BAEHR (*Cellule, 36 (1925), No. 2, pp. 371–444, figs. 15*).—This deals with the relation of the

behavior of chromosomes to Mendelism, sex determination, nondisjunction, crossing over, and intersexuality, including reference to the rôle of cytoplasm in heredity.

Cytological studies on Phaseolus vulgaris, A. I. Weinstein (*Amer. Jour. Bot.*, *13* (*1926*), *No. 4*, *pp. 248–263*, *pls. 4*, *fig. 1*).—An account of a study conducted at the University of Wisconsin upon embryo development in *P. vulgaris*, using as material the buds, pistils, and young fruits of four horticultural varieties. It was found that a considerable proportion of the pollen grains show a tendency to germinate within the anther, but it was not determined whether such grains function in fertilization. Under greenhouse conditions, fertilization occurred within eight or nine hours following pollination. The diploid number of chromosomes was found to be 22 in all cases investigated.

Correlation between shape and behavior of a chromosome, L. V. Morgan (*Natl. Acad. Sci. Proc.*, *12* (*1926*), *No. 3*, *pp. 180*, *181*).—The occurrence of a U-shaped X chromosome is described in explanation of the occurrence of small crossover percentages with large amounts of double crossing over among the crossovers, large amounts of nondisjunction, and the frequent production of gynandromorphs in a certain strain of *Drosophila melanogaster*.

Pollen development in the apple, with special reference to chromosome behavior, J. S. Shoemaker (*Bot. Gaz.*, *81* (*1926*), *No. 2*, *pp. 148–172*, *pls. 3*).—A detailed report upon studies conducted at the Minnesota Experiment Station upon male gametogenesis in the Stayman Winesap and the Delicious apples, varieties which have been found in various States to be poor and good pollinizers, respectively. A résumé of the investigations has been noted from another source (E. S. R., 54, p. 629).

Mutations in the pea, E. J. Delwiche and E. Renard (*Jour. Heredity*, *17* (*1926*), *No. 3*, *pp. 105*, *106*, *fig. 1*).—A brief account of the discovery at the Ashland (Wis.) Substation of two mutant forms of canning peas. One, a sterile form distinguished by funnel-shaped leaves, occurred in the ratio of 5 abnormal to 27 normal plants in the progeny of a single parent plant. The other, distinguished by a lack of glaucous covering of leaves and stems and by adhering seeds, was fertile and bred true to type.

Quantitative inheritance in Phaseolus, K. Sax (*Jour. Agr. Research* [*U. S.*], *33* (*1926*), *No. 4*, *pp. 349–354*).—In a study at the Maine Experiment Station the F_2 segregates of Symonds white bean (bush)×a small-eyed bean (runner) of local origin gave indications that the simple factors for pigmentation, mottling, and extension of the seed coat pigment are independent. Vine type, whether runner or bush, also seemed to depend upon a single factor independent of the above seed coat characters. Date of bloom, leaf type, seed weight, and yield per plant appeared to depend on multiple factors in each case. Some linkage of yield with the extension factor was noted, and date of bloom and leaf type showed some association with certain seed coat characters. Seed weight and date of bloom were associated or linked somewhat with vine type, but such association was opposite that in the parent.

Association of yield per plant with vine type was held of considerable interest from the standpoint of the plant breeder. The runner parent was very weak and unproductive, while the bush parent was vigorous and productive. In the F_2 the combination of vigor and potential productivity with the runner type of vine, which permits a maximum development of pods, resulted in runner segregates more than three times as productive as the runner parent and much more productive than the bush parent.

The genetic basis of susceptibility to tissue transplants, L. C. Strong (*Natl. Acad. Sci. Proc.*, *12* (*1926*), *No. 3*, *pp. 181–186*).—The results of studies

of the inheritance of a type of tumor in mice are reported from the Bussey Institution. Inbred strains, some of which were susceptible while others were nonsusceptible to the tumor, were crossed. The F_1s were all susceptible, but in the F_2s the susceptible and nonsusceptible were produced in the ratio of 9:7. Further tests of the methods of inheritance included the segregation of pure breeding susceptible and nonsusceptible strains from the crossed stocks. The results all indicated that two independent dominant genetic factors were responsible for the susceptibility to this tumor. In determining the susceptibility of individuals a small portion of the tumor was transplanted to each, and if the neoplasm developed it was removed and the animal was used in the breeding experiments as a susceptible individual.

Results in the hereditary analysis of the production of horns in cattle, sheep, and goats [trans. title], W. LANDAUER (*Ztschr. Induktive Abstam. u. Vererbungslehre, 39 (1925), No. 3-4, pp. 294-322*).—A review of the results of experiments dealing with the heredity of horns in cattle, sheep, and goats, including an extensive bibliography.

The Ancon sheep [trans. title], C. WRIEDT (*Ztschr. Induktive Abstam. u. Vererbungslehre, 39 (1925), No. 3-4, pp. 281-286, figs. 6*).—A short-legged sheep is described, which in breeding tests was found due to a factor recessive to the normal.

On the inheritance of albinism and brown pigmentation in mice, H. W. FELDMAN and G. PINCUS (*Amer. Nat., 60 (1926), No. 667, pp. 195-198*).—Since the genes for brown and albinism were found by Castle (E. S. R., 54, p. 29) to be linked in the rabbit, the authors have tested the relations between brown and ruby eye (albino series) factors in mice. Double recessives for brown and ruby eye were mated with double heterozygotes, but no indication of linkage was apparent as the four groups were produced in approximately equal numbers. Analyses of the results of other crosses of the mice carrying brown and pink eye (linked with albinism) led to the same conclusion.

The inheritance of salmon-eye in guinea-pigs, P. W. GREGORY and H. L. IBSEN (*Amer. Nat., 60 (1926), No. 667, pp. 166-171*).—A more complete account of the investigation previously noted (E. S. R., 54, p. 227), with results on additional matings.

Linkage relations in animals, W. A. CRAFT (*Abs. in Okla. Acad. Sci. Proc. [Okla. Univ.], 5 (1925), pp. 97-99*).—Various cases of the linkage of hereditary factors in rodents, poultry, and Drosophila are pointed out. It is suggested that linkage probably exists between various characters in the larger domestic animals, but that, due to the difficulties of studying sufficient numbers, such relations have not been observed, though they may be of much economic importance if discovered.

Linkage between a flower color factor and self-sterility factors, F. G. BRIEGER and A. J. MANGELSDORF (*Natl. Acad. Sci. Proc., 12 (1926), No. 4, pp. 248-255*).—The studies here reported from the Bussey Institution, Harvard University, dealt with the inheritance of ivory flower color and white flower color in Nicotiana and their genetic relations with the sterility factors.

The bearing of genetics on the cytological evidence for crossing-over, T. H. MORGAN (*Cellule, 36 (1925), No. 2, pp. 111-123, figs. 12*).—A discussion of the coordination of genetic and cytological evidence indicating crossing over.

Contribution to the theory of crossing over [trans. title], P. LORENZ (*Ztschr. Induktive Abstam. u. Vererbungslehre, 40 (1925), No. 1-2, pp. 108-114, fig. 1*).—A theoretical method for calculating crossover values is presented, in which it was found that the calculated values for five genes in *Drosophila melanogaster* were similar to the observed values for the crossover percentages between them.

Induced crossing-over variation in the X-chromosome of Drosophila, H. J. Muller (*Amer. Nat., 60 (1926), No. 667, pp. 192–195*).—In continuing the studies of the effect of X rays on regional differences in crossing over (E. S. R., 54, p. 432), the crossing over in different regions of the X chromosome was determined, since this chromosome has the spindle fiber attached to the right-hand end according to Morgan (E. S. R., 54, p. 226). The regions studied in these experiments were the extreme left-hand end from scute to apricot, the long section apricot to bar, and a short right-hand section bar to beadex. The results differ from those of Mavor (E. S. R., 50, p. 529) in that the author found no significant differences in the amount of crossing over in the central portion of the X chromosome, but a slight decrease in the extreme left-hand end and an increase in the right-hand end were fonnd. These results may be taken to indicate that the X chromosome reacts to X rays in a manner similar to the autosomes, which would mean that the bend in the latter is not a factor influencing the effects of the X rays.

Inheritance and correlation of certain characters in rice crosses, Bhide (*Jour. Indian Bot. Soc., 5 (1926), No. 1, pp. 43–45*).—Rice crosses were made at the Rice Breeding Station, Karjat, in an endeavor to combine earliness, fineness of grain, productivity, erectness, and freedom from sterility. According to indications obtained in F_2, lateness of flowering is dominant to earliness in certain reciprocal crosses, and sparseness seems to be dominant to compactness, the ratios being about 3 to 1. Compactness or density of panicle seems to be generally associated with short grains and also with sterility at the top of the panicle. Standing habit appeared to be correlated with erectness of the flag. There were indications that lodging was dominant to erectness in the F_1 hybrid. Yield is positively correlated with tillering. Cumulative factors seemed to exist in the cases of panicle length and grain length.

Prenatal death in the pig and its effect upon the sex-ratio, F. A. E. Crew (*Roy. Soc. Edinb. Proc., 46 (1925–26), No. 1, pp. 9–14*).—The influence of prenatal mortality on the sex ratio has been investigated in swine. Records on 1,472 newborn pigs showed that the sex ratio at birth was 50.0±0.77 or practically equality, which has been confirmed by others. Various investigators have found that prenatal mortality in swine is very heavy. In 27 parturient sows, the average litter size was 7.9, but the average corpora luteum number was 13.

The reproductive organs of 102 pregnant sows were obtained from abattoirs, and the number and sex of the fetuses compared with the corpora lutea in the ovaries. There were 1,396 corpora lutea, 592 male, 436 female, and 89 atrophic fetuses. The proportion of males, 56.18±0.78 per cent, indicates that the sex ratio at conception is much higher than the equality of the sexes found at birth. Further indications that prenatal mortality falls heavier on males was found from the sex ratios of the fetuses classed according to average weights. In the youngest class, 0 to 249 gm., there was 60.65±1.08 per cent of males, but the proportion of males decreased as the average size increased and in the class over 750 gm. there was only 50.88±1.82 per cent of males. There was no difference in the sex ratio or mortality of the fetuses in the two cornua, although more corpora lutea and more fetuses were found on the right side. Causes for the high primary sex ratio are discussed, from which it is suggested that a differential functional activity of the two sorts of sperms is more likely than a differential production of the two types of sperms.

The relative viability of male and female mouse embryos, E. C. MacDowell and E. M. Lord (*Amer. Jour. Anat., 37 (1926), No. 1, pp. 127–140, figs. 5*).—In continuing the study of sex ratios in mice, 840 litters have been classified

according to the percentage of males and the amount of prenatal mortality in each litter. It is concluded that there is no continuous selective elimination of one sex or the other in utero since the primary sex ratio was found to be equal (E. S. R., 53, p. 732), no significant difference in the sex ratio was associated with difference in the amount of prenatal mortality, and the correlation coefficients between the percentage of males and the percentage of prenatal mortality within litters were small and less than twice the probable error.

Partial hermaphroditism and parthenocarpy in the date palm, Phoenix dactylifera L. [trans. title], H. SCAETTA (*Atti R. Accad. Naz. Lincei, 6. ser., Rend. Cl. Sci. Fis., Mat. e Nat., 2 (1925), No. 12, pp. pp. 568–573, figs. 4*).—The author reports the discovery of a male date palm carrying some hermaphroditic blossoms, and also of a female palm which, although regularly pollinated, bore clusters of seedless dates. Both trees were located in the palm gardens of Bengazi, Cyrenaica.

Observations upon the preparation and standardisation of the ovarian hormone, F. DICKENS, E. C. DODDS, and S. WRIGHT (*Biochem. Jour., 19 (1925), No. 5, pp. 853–859, fig. 1*).—The authors have been able to extract the ovarian hormone from pig ovaries according to the method (slightly modified) of Allen and Doisy (E. S. R., 52, p. 130). An ovariectomized rat was kept in a continuous state of oestrum for 14 days by the use of this extract. Further experiments indicate that the active principle inhibits the action of insulin.

Observations of the definitive sex-cells of the chick, H. HULPIEU (*Okla. Acad. Sci. Proc. [Okla. Univ.], 5 (1925), pp. 70–74*).—The germinal history of the chick has been studied in preparation of chick embryos ranging in age from the third day of incubation to two days after hatching, in an endeavor to throw light on the theory of the continuity of germ plasm. The changes observed leading up to the formation of the germ cells are described, from which it is concluded "that the primordial sex cells found in the germinal epithelium of the developing gonad give rise to the germ cells found in the testis of the chick three or four days after hatching."

Cystic testes, a cause of male sterility in the domestic fowl, J. W. GOWEN (*Poultry Sci., 5 (1926), No. 3, pp. 146–148, figs. 2*).—A case is described from the Maine Experiment Station of a Silver Campine rooster which proved sterile in his second year and only 22 chicks were produced from 477 eggs laid by hens with which he was mated in the preceding year. A post-mortem examination showed that the left testis was approximately four times the normal size, while the right testis was misshapen. The presence of cysts in both testes were found to block the ducts. It is of interest that the plumage of the cock was normal for the breed, i. e., hen feathered, notwithstanding the enlargement and penetration of the testes and the fact that secretions from the testes are supposed by Goodale to control this type of plumage (E. S. R., 41, p. 269).

The monthly birth-rate, J. SANDERS (*Jour. Hyg. [London], 24 (1925), No. 3–4, pp. 274–290, figs. 5*).—Essentially noted (E. S. R., 55, p. 432).

FIELD CROPS

[Field crops work at the Duluth, Minn., Substation, 1924 and 1925], M. J. THOMPSON (*Minnesota Sta., Duluth Substa. Rpt. 1924–1925. pp. 5–20, 22, 23, 35, figs. 4*).—Experimental activities (E. S. R., 51, p. 636) reported on in these pages include variety tests with spring wheat, rye, peas, oats, barley, corn, alfalfa, sweet clover, sunflowers, potatoes, and miscellaneous root crops, cultural (including seeding) tests with oats, barley, alfalfa, sunflowers, potatoes,

and rutabagas, a liming trial with alfalfa, a study of the relation of sunflower growth to rainfall and temperature, spraying experiments with potatoes, and crop rotations.

[Field crops experiments at the Morris, Minn., Substation, 1924], P. E. MILLER (*Minnesota Sta., Morris Substa. Rpt. 1924, pp. 21–33*).—The current and average results in variety tests with spring and winter wheat, oats, barley, rye, corn, flax, soy beans, field beans, and potatoes; trials of cereal mixtures; and crop rotations are reported on as heretofore (E. S. R., 53, p. 131).

Comparative morphological variety studies with cereals [trans. title], H. RAUM (*Ztschr. Pflanzenzücht., 11 (1926), No. 2, pp. 73–109*).—The studies reported were concerned with the expression of tillering, weight of spike and weight of straw, and the relations between tillering and weight of spike and yield and weight of plant in varieties representative of different species and subspecies of Triticum and Hordeum and including recent productions of plant breeders. The relation of awning to other characters in oats varieties was also considered.

Color in alfalfa seed is important, G. STEWART (*Seed World, 19 (1926), No. 9, pp. 12, 13*).—Alfalfa seed from within the State was separated into its component colors and was subjected to germination tests at the Utah Experiment Station. The results are summarized in the following table:

Average results of germination studies on color separations of alfalfa seed

Color	Average weight of 200 seeds	Relative weight (bulk seed check =100)	Average germination on blotters	Germination in ⅛-inch sand	Blotter: soil ratio (blotter =100)	Establishment of plants in moist sand at ⅛-inch depth	Relative agricultural value (bulk seed check =100)
	Grams		*Per cent*	*Per cent*		*Per cent*	
True color (bright yellow or bright olive green)	0.4345	114	68.8	59.0	87	66.1	122
Light green	.3599	94	67.4	33.8	50	58.8	100
Light brown	.4250	111	67.0	45.2	67	53.6	62
Dark green	.2905	76	53.0	34.0	64	45.3	53
Dark brown	.3751	98	40.0	14.6	37	40.5	38
Shriveled green	.2295	60	25.4	4.4	17	24.2	34
Shriveled brown	.3001	78	41.8	9.0	22	18.7	20

That the ordinary laboratory germination test does not truly indicate the actual agricultural value of seeds seems to be shown by the great reduction in germination when the seeds are compelled to emerge through a thin soil layer kept in the most favorable condition. The germination either on blotters or in the soil of discolored seed is decidedly less than of bright, true colored seed. Plump seed surpassed shrunken seed in this respect. Germination is considerably slower with discolored seed, which would cause far less favorable starting of the crop. These experiments suggest a very wide difference between the different colors of alfalfa seed, the bright yellow or bright olive green seed being much more desirable than any other color.

[Experiments with alfalfa cuttings], N. SYLVÉN (*Sveriges Utsädesför. Tidskr., 35 (1925), No. 5, pp. 211–228, figs. 9*).—Cuttings of *Medicago sativa*, *M. sativa* × *M. falcata*, and *M. falcata* representing 8 different types, viz, 1-, 2-, 3-, and 4-node cuttings, cut just below the lowest node and also cut from 1 to 2 cm. below the node, were compared in hotbed and cold frame at Svalöf.

With *M. sativa* cuttings the hotbed plants always surpassed in average height the plants raised in the cold frame. Cuttings from the uppermost or lowest

parts of the stem were the only ones to succumb to wilting. The 1-node and especially the 2-node cuttings gave the most vigorous and tallest plants, at least in the hotbed. The percentage of successful slips was on the whole satisfactory and decidedly higher in 4-node types. The slips cut just below the node seemed to surpass the corresponding slips from 1 to 2 cm. below the lowermost node with regard to the average height attained, although the loss was somewhat greater. Similar results were had with *M. falcata* and the hybrid. The *M. falcata* cuttings throughout produced more vigorous plants than did *M. sativa* and the hybrid.

In growing alfalfa cuttings the 1-node and the 2-node cuttings should evidently be used to conserve material, but no slips made of the 1 or 2 lowest and uppermost internodes of the mother stem. The adventitious root system developed in slips cut from 0.5 to 1 cm. below the node seems to become more concentrated and vigorous than on slips cut otherwise. Hotbed slips seem to have reached a suitable transplanting stage about 3 to 4 weeks after cutting, several weeks earlier than those raised in cold frame.

At what depth should clover seeds be planted? W. SCOTT (*Iowa Acad. Sci. Proc., 31 (1924), pp. 183-187*).—Red clover seed planted at 1-, 0.75-, and 0.5-in. depths in soil with 20 per cent moisture content germinated averages of 32, 44–69, and 66 per cent as compared with 82, 77, and 82 composite tests of germinations. Although germination failed almost completely at moisture contents up to 15 per cent, moisture percentages between 15 and 50 did not affect the percentage of germination.

The clovers in New York, L. A. DALTON (*N. Y. Agr. Col. (Cornell) Ext. Bul. 134 (1926), pp. 23, pl. 1, figs. 11*).—A practical discussion of the causes for clover failure and their remedies, with information on the culture and management of alsike and medium red clover for pasture, hay, and seed.

What is the absolute value of the prevailing method of selecting kernels from ears of seed corn for testing purposes? W. SCOTT (*Iowa Acad. Sci. Proc., 31 (1924), pp. 217-223*).—According to tests made at the Iowa State Teachers College, the custom of selecting less than six kernels per ear is not reliable.

An investigation into the relative utility and the reliability of various methods of comparing the yields of cotton from experimental plots, R. THOMAS and K. SAWHNEY (*Iraq [Mesopotamia] Dept. Agr. Mem. 11 (1925), pp. [3]+48, figs. 4*).—The investigation reported dealt with the application of statistical methods in interpreting the results of variety, irrigation, spacing, and cultivation tests with cotton grown at the Rustam Experiment Station near Bagdad.

The Texas cotton seed registration and certification act, E. P. HUMBERT, G. B. TERRELL, ET AL. (*Tex. Dept. Agr. Bul. 80 (1925), pp. 16, figs. 2*).—The text of the law is given, with regulations and instructions relative to its enforcement.

Cotton culture in Argentina [trans. title], C. D. GIROLA (*Mus. Agr. Soc. Rural Argentina, Pub. 49 (1926), pp. 20+[5], pl. 1, figs. 6*).—This is similar in scope to the publication noted earlier (E. S. R., 46, p. 635), and gives the details of cotton-growing contests conducted in 1923–24 and 1924–25.

[Annual reports of the Indian Central Cotton Committee, Bombay, for the years ending August 31, 1924 and 1925] (*Indian Cent. Cotton Com., Bombay, Ann. Rpts., 1924, pp. IV+73, pls. 7; 1925, pp. [1]+122*).—These reports summarize the activities of the organization (E. S. R., 50, p. 830) for the period indicated. The 1925 report also includes articles on Spinning Tests on Indian Cottons; The Present Position of Cotton Research in India; and The Improvement of the Cotton Crop, by G. R. Hilson.

Hemp, P. F. Lévêque (*Le Chanvre. Paris: Libr. Agr. Maison Rustique, 1925, pp. 80, figs. 28*).—A popular treatise on the culture of hemp and preparation of hemp fiber, with special reference to practices in the Department of Sarthe, France.

The variation in individual sugars in the Jerusalem artichoke (Helianthus tuberosus) during growth, S. H. Collins and R. Gill (*Jour. Soc. Chem. Indus., 45 (1926), No. 11, pp. 63T–65T*).—Tabulated analyses show the composition, especially the contents of sucrose, dextrose, and levulose, of the stalk and tubers of the Jerusalem artichoke at several stages of growth.

Svalöf Orion oats c, 01102 [trans. title], Å. Åkerman (*Sveriges Utsädesför. Tidskr., 35 (1925), No. 5, pp. 235–239, figs. 2*).—A new selection from Orion oats exceeding that variety in yielding capacity and in strength of straw is described. In comparative tests with Orion *b* and Mesdag oats, Orion *c* generally led in grain and straw yields and in quality as determined by weight per bushel, weight per 1,000 kernels, and percentage of kernel, and produced the strongest straw. Orion *c* ripened several days later than Orion *b*, which proved a disadvantage in the more northern localities.

Potato variety descriptions, R. O. Staudte (*Kartoffelsorten-Beschreibung. Schweidnitz: L. Heege, 1925, pp. 120, pl. 1, figs. 2*).—A scheme for abbreviating varietal descriptions is offered, with discussion of the relations of tuber and plant characters. Varietal descriptions are listed alphabetically in breeders' groups and according to color and to maturity.

Potato varieties in Switzerland and their diseases, E. Neuweiler (*Die Wichtigsten Kartoffelsorten in der Schweiz und Ihre Häufigsten Krankheiten. Brugg: Effingerhof, 1925, pp. 51*).—This manual for field inspection tabulates the stalk and tuber characteristics of 199 sorts of potatoes, describes such characteristics and indicates their interrelations, and notes the effects of important diseases and insects.

Ramie, F. Michotte (*Traité Scientifique et Industriel des Plantes Textiles. La Ramie. Paris: Soc. Propagande Colon., 1925, 2 ed., vol. 1, pp. 159, pl. 1, figs. 20*).—Information is presented on the botanical relations and characteristics of ramie, its adaptation, methods of culture and preparation of the fiber in different parts of the world, the commercial status of the fiber, and substitute fibers.

Experiments with sugar beets in 1924–1925 [trans. title], W. E. Cross (*Rev. Indus. y Agr. Tucumán, 16 (1925), No. 1–2, pp. 5–17, figs. 2*).—The comparative yields, sucrose content, and sugar production are tabulated for a number of strains of sugar beets tested in Tucumán, with comment on the effect of manuring and time of planting. See also an earlier note (E. S. R., 51, p. 341).

Breeding sugar beets at Svalöf [trans. title], G. Sundelin (*Sveriges Utsädesför. Tidskr., 35 (1925), No. 6, pp. 253–302, figs. 12*).—In a discussion of methods and principles involved in breeding work with sugar beets at Svalöf, Sweden, it is indicated that the elite strains obtained through hybridization generally yield better than those derived by line breeding or mass selection. Lines produced by H. Nilsson through inbreeding have yielded less than those resulting from the foregoing methods and were quite as variable in sugar percentage and appearance and size of roots. The low yields of the inbred strains as a rule seemed due to the occurrence of inferior abnormalities. The correlation of the ratio of green weight to root weight with sugar percentage is also discussed.

[Reports on the sugar-cane experiments for the seasons between 1923–1925 and 1924–1926], J. P. D'Albuquerque (*Barbados Dept. Agr., Rpt.*

Sugar-Cane Expts., 1923–1925, pp. [1]+23; 1924–1926, pp. [1]+27).—Continued investigations with sugar cane in Barbados (E. S. R., 54, p. 439) included trials of varieties and seedlings, production of seedlings, fertilizer tests, and comparisons of different types of cuttings. The usual information is given on rainfall, the prevalence of the root borer and brown hard back, and the yields of varieties on different soil types. The new series seedling B. 417, which gave the highest returns as plant cane in both tons of cane and pounds of sucrose of any of the varieties in both black and red soils, was derived from seed obtained from B. 6835, which is also the seed bearing parent of B. H. 10 (12), B. 67, and other promising varieties.

Sugar-cane experiments in the Leeward Islands [1923–24], A. E. Collens et al. (*West Indies Imp. Dept. Agr., Leeward Isl. Sugar-Cane Expts., 1923–24, pp. [2]+51*).—Comparisons of varieties and seedlings of sugar cane in Antigua, St. Kitts-Nevis, and Montserrat are reported on as heretofore (E. S. R., 53, p. 837). B. H. 10(12), B. 3922, B. 4596, B. 6308, Ba. 6032, and B. 4452 led the varieties tested during the year in Antigua.

Studies in sugarcane germination, T. S. Venkatraman (*Agr. Jour. India, 21 (1926), No. 2, pp. 101–106, figs. 10; also in Planter and Sugar Manfr., 76 (1926), No. 23, pp. 448, 449, figs. 10*).—Observations at the Coimbatore, India, Sugar Cane Breeding Station demonstrated that the internodal portion of a cane has a distinct use in the germination and early growth of the young plant, both of which were affected adversely by deprivation of root eyes and pith. The ordinary 3-bud cutting contains enough nutrient to maintain the plant for at least six weeks. Tests showed that sugar cane buds would germinate even when deprived of most of the cane-set, so long as one healthy root eye and the accompanying rind were attached at the time of planting.

Preliminary results with the sugar cane varieties P. O. J. 2878 and 2883 [trans. title], J. Kuijper (Kuyper) (*Arch. Suikerindus. Nederland. Indië, 33 (1925), No. 36, pp. 901–905*).—Varietal comparisons in many localities and different soil types in Java demonstrated the merits of the new varieties P. O. J. 2878 and 2883, both derived from P. O. J. 2364×E. K. 28. P. O. J. 2878 has produced more sugar per unit area than E. K. 28 and seems to be superior to P. O. J. 2883. In spite of its tendency to arrow, which results in reduced cane production, P. O. J. 2883 is also considered valuable.

Varieties of sugar-cane in Queensland, H. T. Easterby (*Queensland Bur. Sugar Expt. Stas. Bul. 2, 2. ed., rev. (1926), pp. [2]+37*).—All sugar cane varieties known to have been introduced into Queensland are listed, those grown in the past or at present are described, and analyses of varieties now cultivated are tabulated, with varietal recommendations for different sections of the State.

[Tobacco investigations in Canada in 1924], C. M. Slagg, J. E. Montreuil, H. A. Freeman, and T. G. Major (*Canada Expt. Farms, Tobacco Div. Rpt. 1924, pp. 32, figs. 7*).—Experimental work with tobacco (E. S. R., 53, p. 340) during 1924 included varietal comparisons at Ottawa, and fertilizer, variety, seed bed, and nicotine studies at Farnham, Que. Freeman reported on the status of Canadian tobacco in the British Isles, and Major summarized the progress on projects concerned with different phases of the root rot and mosaic diseases and with seed and soil sterilization. Conditions in the producing districts are described, with statistics on acreage and yield. Work at the Harrow, Ont., Station has been noted earlier (E. S. R., 54, p. 737).

Data from studies on the nicotine content in eight commercial varieties indicated that the leaf content of nicotine increases as the plant matures, reaching a maximum in these trials when the plant was fully ripe. Considerable variation among different varieties was also apparent, but the tendency of the

nicotine content to increase as the plant matures was common to all sorts tested. The proportionate rate of increase also varied, the mature plants of the types tested exhibiting from two to four times the nicotine content of those harvested at topping time. Leaves from mature plants of all varieties tested averaged nearly three times the nicotine content of those from plants harvested at topping time.

Plants neither topped nor suckered accumulated much less nicotine than plants topped and kept free of suckers. When topped and suckered all varieties showed uniformly a progressive and marked increase in nicotine from topping time until harvest, whereas when developed undisturbed their nicotine contents with one exception either remained stationary or increased only slightly from flowering time on.

Analyses of leaves from different positions on the stalk showed that as the plant matures nicotine tends to concentrate in much larger quantities in the upper leaves than in the lower. At blossoming time leaves on the lower quarter of the plant had uniformly the highest nicotine content, while thereafter a rapid and marked increase in nicotine occurred in the upper leaves, this being particularly noticeable with topped and suckered plants.

Tobacco investigations throughout the world, P. ZIMMERMANN (*Tabakforschung in Aller Welt. Dresden: Tabakwelt, 1926, pp. 34*).—Attention is called to the research activities of official experiment stations and institutions with tobacco in the various political subdivisions of the world, the work in Germany and in former German colonies being described in some detail.

Tobacco: Its culture and manufacture, R. KISSLING (*Tabakkunde, des Tabakbaues und der Tabakfabrikation. Berlin: Paul Parey, 1925, 5. rev. ed., pp. VIII+480, figs. [104]*).—This volume gives historical, geographical, botanical, and commercial information on tobacco and treats in detail the chemistry, culture, and curing and fermentation of the crop, the manufacture of tobacco products, and the use of tobacco as a stimulant.

Burbank wheat, W. E. ZUPPANN (*Northwest. Miller, 146 (1926), No. 5, p. 456, fig. 1*).—A brief account of the characteristics and behavior of Burbank Quality, an early hard white wheat developed by the late Luther Burbank.

Kanred wheat [*trans. title*], E. M. NELSON (*Min. Agr. [Argentina], Secc. Propaganda e Informes Circ. 597 (1926), pp. 28, fig. 1*).—A compilation of the experiences of growers with Kanred wheat in Argentina.

Coefficient of compactness and value of heads of wheat, J. E. D. WHITMORE (*Sci. Agr., 6 (1926), No. 9, pp. 314–317*).—A method is outlined to determine mathematically coefficients of compactness of wheat spikes and to determine value from compactness, plumpness, and number of spikelets.

The protein test in marketing wheat, W. O. WHITCOMB and E. J. BELL, JR. (*Montana Sta. Bul. 189 (1926), pp. 31, figs. 11*).—Popular information is given on methods of determining the protein content of wheat and on its practical value. Protein is defined, its function in bread making described, the relation of moisture, dockage, and smut to the protein content is pointed out, and data are included on the protein content of Montana wheat.

The fertilization of lawns, S. D. CONNER (*Ind. Acad. Sci. Proc., 40 (1924), pp. 169, 170*).—Fertilizer tests on lawns at the Indiana Experiment Station suggest the use of a complete fertilizer with a rather high nitrogen content. Choice of the available nitrogen sources, sodium nitrate or ammonium sulfate, is contingent on the grasses grown. Lime seems profitable only on the most acid soils.

Seeding, fertilization, and management of meadows, A. F. GUSTAFSON (*N. Y. Agr. Col. (Cornell) Ext. Bul. 156 (1926), pp. 20, figs. 10*).—Methods are

suggested for producing better hay at a lower expenditure for fertilizers than at present on many New York farms.

Report on grass seed mixtures, 1907–13, W. M. Findlay (*North of Scot. Col. Agr. Bul. 30, 2. ed., abridged (1926), pp. 75*).—Recent experiments in Scotland with mixtures of grass and clover seeds have in general confirmed the earlier conclusions (E. S. R., 31, p. 430). Time of seeding and application of manure and fertilizers, methods of grazing, and time of cutting hay are indicated as important factors in pasture production. The behavior of different varieties and strains of grasses and clovers is described, and grazing trials are reported briefly.

Grass and clover seed (*Klee- und Grassaatenbuch. Berlin: Oscar Schlegel, 1924, pp. 56, figs. 9*).—The characteristics of important sorts of grass and clover seeds are summarized for the benefit of the German seed trade.

Viability tests of seeds of different ages, C. M. King (*Iowa Acad. Sci. Proc., 31 (1924), pp. 257–264*).—This paper gives some of the details of longevity studies (E. S. R., 51, p. 433; 53, p. 734) made with seeds of 76 species at the Iowa Experiment Station.

Manual of seed certification of the Virginia Crop Improvement Association, G. W. Patteson, jr., and T. C. Maurer (*Blacksburg: Va. Crop Impr. Assoc., 1926, pp. [2]+30*).—The organization and its functions are described, with outlines of the requirements for certification of registered and certified seed of different crops.

Recent Indiana weeds, 1924, A. A. Hansen (*Ind. Acad. Sci. Proc., 40 (1924), pp. 256–258, fig. 1*).—Plants reported as new in Indiana since the previous report (E. S. R., 51, p. 641) include slender Canada thistle (*Cirsium arvense mite*), marsh marigold (*Caltha flabellifolia*), musk thistle (*Carduus nutans*), fluellin (*Kickxia elatine*), and crown vetch (*Coronilla varia*). Infestations of field pansy (*Viola rafinesquii*), reed canary grass (*Phalaris arundinacea*), *Festuca capillata*, and hoary cress (*Lepidium draba*) are also noted.

Pennsylvania weeds, E. M. Gress (*Penn. Dept. Agr. Bul. 416 (1925), pp. [2]+27, figs. 15*).—Weeds and methods of control are discussed, with descriptions and control methods indicated for the worst weeds in Pennsylvania. These include Canada thistle, plantain, chicory, false flax, field pepper grass, horse nettle, garlic, winter cress, cockle, perennial sow thistle, quack grass, clover dodder, wild morning glory, and hawkweeds.

Weed eradication, V. Vermorel (*Destruction des Mauvaises Herbes. Paris: Libr. Agr. Maison Rustique, [1925], pp. 39, figs. 12*).—Solutions of sulfuric acid and of other chemicals are indicated for the destruction of weeds in cereal fields, with instructions for mixing and application.

The eradication of bracken, J. H. M. Home (*Scot. Jour. Agr., 9 (1926), No. 2, pp. 123–129*).—Experience in Scotland over more than a decade indicates that bracken can be practically eradicated from hill ground during a 3 to 5 year period. The ideal stage for cutting is when the height growth is complete and before the stems become hard. In practice, cutting should begin about 10 days before this stage is reached and finish within about 3 weeks. The date for cutting may vary from June 15 to July 1, according to season. Cuttings once begun should be continued annually until the desired result is had. Cutting by hand labor with a scythe or hook is the most practical method of clearing, and the largest area can be covered thereby. A horse mower may be useful in certain cases, and sticks or wire switches may be used among stones. Spraying with sulfuric acid is scarcely practical on any scale unless water is easily available. Costs will vary according to the number of cuttings required and the situation and nature of the area.

Puncture vine, W. C. JACOBSEN (*Calif. Cult., 66 (1926), No. 20, pp. 557, 559, 579, figs. 6*).—The rapid spread of the puncture vine in California (E. S. R., 44, p. 439) is described, and control methods are suggested. Intensive cultivation may control the pest in orchards or vineyards. On untilled areas a light spray of some form of light fuel oil or distillate, emulsified by using 25 gal. of oil, 75 gal. of water, and 1 or 2 lbs. of caustic, is said to be very effective in killing the plants. This is followed with a second spray, an emulsion of half oil, half water, and 1 or 2 lbs. of caustic, to penetrate the burs after they are dried and shriveled by the killing of the plant.

HORTICULTURE

The gardener's assistant, edited by W. WATSON (*London: Gresham Pub. Co., 1925, vols. 1, pp. XI+224, pls. 3, figs. 207; 2, pp. VI+237, pls. 4, figs. 236; 3, pp. VI+232, pls. 2, figs. 323; 4, pp. V+224, pls. 5, figs. 204; 5, pp. V+232, pls. 3, figs. 242; 6, pp. V+201, pls. 3, figs. 122*).—A comprehensive and systematically arranged treatise on fruit, vegetable, medicinal, and ornamental plants, their varieties, culture in the field and greenhouse, propagation, protection from various pests, etc. According to a note in volume 1, four distinct editions of this work have appeared. The first two, issued in 1859 and 1875, respectively, were edited by R. Thompson, and the third appeared in 1900 under the name of R. Thompson, although revised and entirely remodeled by W. Watson, the present editor.

Fruit and vegetable production, L. C. CORBETT, H. P. GOULD, T. R. ROBINSON, G. M. DARROW, G. C. HUSMANN, C. A. REED, D. N. SHOEMAKER, C. J. HUNN, J. H. and W. R. BEATTIE, [W. STUART], J B. KINCER, and L. B. FLOHR (*U. S. Dept. Agr. Yearbook 1925, pp. 151–452, figs. 195*).—A comprehensive survey of the horticultural industry of the United States from the viewpoint of production. The article is illustrated with numerous views and with charts showing the location and magnitude of the principal crops. The various factors of climate, soil, culture, methods of handling, and marketing, which underlie the success of the industry, are discussed.

Fruits and vegetables, L. C. CORBETT, H. P. GOULD, and W. R. BEATTIE (*U. S. Dept. Agr. Yearbook 1925, pp. 107–124, figs. 6*).—A brief article pointing out the present-day value of fruit and vegetable crops in the United States and outlining the early history, growth, and expansion of the industry, with notes on important varieties and on the work of prominent early horticulturists.

Diseases and pests of fruits and vegetables, M. B. WAITE, W. W. GILBERT, N. A. COBB, W. R. BEATTIE, F. E. BROOKS, J. E. GRAF, W. B. BELL, and W. L. MCATEE (*U. S. Dept. Agr. Yearbook 1925, pp. 453–599, figs. 92*).—A general discussion upon the animal and fungus pests of orchard and garden crops, giving the latest approved methods of combating important forms and outlining the measures taken to prevent undue spread.

Horticultural problems, C. A. MCCUE (*Peninsula Hort. Soc. [Del.] Trans., 38 (1924), pp. 39–47*).—A brief discussion upon various problems such as pollination, soil management, fertilization, spraying, and marketing, whose solution would greatly aid the fruit and vegetable growers of Delaware and eastern Maryland.

[Horticultural work at the Duluth, Minn., Substation], M. J. THOMPSON (*Minnesota Sta., Duluth Substa. Rpt. 1924–1925, pp. 20–22*).—A brief report upon cultural and varietal tests with fruits and vegetables. On account of the severe winters in the locality, one-year nursery trees were found less satisfactory than older stock. Apple trees on southeast slopes grew and yielded better than those planted on the northwest exposures.

[Variety testing at the Morris, Minn., Substation], P. E. Miller (*Minnesota Sta., Morris Substa. Rpt. 1924, pp. 33–38*).—As usual (E. S. R., 53, p. 140), brief notes are given upon the hardiness and behavior of various fruits and ornamental plants. In general the varieties developed at the Fruit Breeding Farm at Zumbra Heights were found very promising.

Creation of new varieties of plants by the action of electricity and various rays upon the pollen [trans. title], G. Truffaut (*Jardinage, 13 (1926), No. 103, pp. 227–230, figs. 12*).—A popular account of investigations conducted in Italy in which the pollen of various plants, including the hollyhock, poppy, grape, and summer squash, was exposed to violet rays preceding its use in pollination, with the alleged result of inducing mutant forms.

The vegetable regions of Indiana, I. C. Hoffman (*Ind. Acad. Sci. Proc., 40 (1924), pp. 273–276, fig. 1*).—A discussion of the geographical distribution of vegetable production in Indiana.

Hybridization in breeding canners' peas, W. Brotherton, jr. (*Canner, 62 (1926), No. 23, pp. 23, 24, fig. 1*).—Briefly outlining the technique of pea hybridization, the author reports that this work can be successfully carried on in the greenhouse, thus making possible the production of two crops in one year.

What the horticultural investigations are accomplishing, H. B. Tukey (*N. Y. State Hort. Soc. Proc., 71 (1926), pp. 156–165*).—A progress report upon pomological investigations conducted by the New York State Experiment Station in the Hudson River Valley.

At Viewmonte, apple trees receiving 6 lbs. of nitrate of soda just as the first green color was evident in the spring yielded from 3 to 5 bu. more picked apples per tree than did nonnitrated trees. The fruit of the latter trees was, however, more attractively colored and larger in size. Hence the author warns against the adoption of new orchard practices without careful trial. On the other hand, with old fruiting cherry trees nitrogen applications were distinctly beneficial in promoting growth. The effect of fertilizers and pruning on newly planted trees, discussed below, is again reviewed.

In pollination tests with the peach, the J. H. Hale fertilized with itself, Belle, Carman, Champion, Elberta, Hiley, and Rochester set 0, 33.3, 28.5, 37.5, 35.8, 30.7, and 36.1 per cent, respectively. Further work (E. S. R., 54, p. 242) with sweet cherry pollination showed Lambert, Napoleon, Schmidt, Black Tartarian, and Windsor to be self-sterile, and Lambert and Napoleon to be intersterile. All five set abundantly when pollinated with compatible varieties. The importance of interplanting varieties is again discussed.

Records of the set of fruit on blossoming pear spurs infested with psylla showed the insect to be disastrous to successful pollination. Notes on the fruiting habit of the Wealthy, Baldwin, Northern Spy, and McIntosh are included.

Pruning and fertilizing young apple trees at planting, H. B. Tukey (*Amer. Soc. Hort. Sci. Proc., 22 (1925), pp. 13–20*).—Nitrate of soda applied in various manners and amounts to newly set Baldwin and Rome Beauty apple trees proved dangerous in all cases except where used at the rate of 0.5 lb. per tree applied in a circle from 30 to 40 in. distant from the trunk. These trees made the greatest trunk and terminal shoot growth during the first season, with control trees a close second. The application in the hole of 0.5 lb. of nitrate of soda was fatal to both 1- and 2-year-old Rome Beauty trees, while large 1-year-old Baldwins showed a slight recovery late in the season. As small a dose as 0.5 lb. placed in a circle 2 in. distant from the trunk caused a slight tip burning of the leaves.

A comparison of thinning out and cutting back of limbs at time of planting young Cortland apple trees showed the cut-back trees to make the longer

shoot growth and the thinned trees the greater trunk gain during the initial season. In the second season the trunk growth increments of both groups were practically equal. Trees that were naturally well shaped and not cut back made the most symmetrical specimens, with those that were well formed and cut back next in quality. Trees that were ill shaped and not balanced by cutting back were hopelessly misshapen.

The relationships between condition of the tree growth and fruitfulness, A. J. HEINICKE (*N. Y. State Hort. Soc. Proc., 71 (1926), pp. 216–225*).—Pointing out the association of strong, vigorous growth and fruitfulness in the apple, the author discusses the importance of adequate nutrition and pruning to maintain trees in a thrifty, productive condition.

Pollination and other conditions determining the set of fruit, A. J. HEINICKE (*N. Y. State Hort. Soc. Proc., 71 (1926), pp. 42–52*).—A discussion of recent advancements in the knowledge of pollination and nutrition in fruit trees in relation to the setting and production of fruit.

Fertilizers for orchards, C. A. MCCUE and F. S. LAGASSE (*Peninsula Hort. Soc. [Del.] Trans., 39 (1925), pp. 47–50*).—Summarizing 15 years' records taken on Jonathan trees comprising portions of an experimental apple orchard planted at the Delaware Experiment Station in 1908, the authors report that a direct correlation exists in most instances between trunk circumferences and yields. Fertilizers showed no consistent effect on the time of blossoming of the various plats. Nitrogen increased the percentage of blooms that set, but no fertilizer showed any effect upon the commencement of fruiting. Plats receiving nitrogen either alone or in combination with phosphoric acid or muriate of potash bore the largest and most regular crops. In respect to yield, acid phosphate or muriate of potash, alone or in combination, gave no benefit. Nitrate of soda, applied alone or in combination with phosphorus or potassium, always increased yields, but when combined with either phosphorus or potassium was more effective than when used alone. Of the various fertilizer combinations, that of nitrogen and phosphorus showed the greatest gain over the corresponding control plats.

Cultivation of fruit trees, M. G. RETUERTA (*Cultivo de Frutales. Madrid: Libr. Luis Santos, 1925, pp. [15]+301, figs. 69*).—A general discussion of fruit culture throughout the world, taking into consideration such items as habits of growth, propagation, soils, fertilizers, etc.

Experimental results in pruning apple trees, E. C. AUCHTER (*Peninsula Hort. Soc. [Del.] Trans., 38 (1924), pp. 77–86*).—From the results of several experiments on the pruning of young apple trees, the data of which are presented in tabular form, the author concludes that a low headed tree of a modified central leader type, having five or six main branches, is a desirable form. Pruning should be done while the tree is in a dormant condition and should be restricted except in the case of old devitalized trees, which usually respond to heavy pruning. Newly planted trees should be shortened back moderately for the first two years to promote stocky growth. Certain varieties, notably Yellow Transparent, produce much of their first fruit on terminals and hence should not be shortened for more than two years. Thinning out crowding terminals is advised. Pruning was found not only to delay fruiting, but also to decrease the size of the crops.

The rejuvenation of peach orchards, E. C. AUCHTER (*Peninsula Hort. Soc. [Del.] Trans., 38 (1924), pp. 87–90*).—Of various types of pruning, namely, complete dehorning, moderately heavy, light, and partial, compared with no pruning as means of restoring a worn-out peach orchard to a productive condition, moderately heavy pruning when used in connection with good cultural practices gave the best success (E. S. R., 47, p. 342).

Cranberry flower-bud investigations, D. S. Lacroix (*Jour. Agr. Research [U. S.], 33 (1926), No. 4, pp. 355–363, figs. 4*).—Histological studies at the Massachusetts Cranberry Substation showed the first evidence of flower-bud differentiation on August 10, 1922, and August 15, 1924. Growth was slow during the autumn months, apparently ceasing altogether during the winter, but proceeded rapidly following the removal of the winter flowage. Late draining delayed the resumption of blossom-bud growth, but the development proceeded thereafter so rapidly that late held bogs were only a few days later than early drained bogs in reaching full bloom. Counts made of the number of blossoms per 100 upright shoots on early and late drained bogs showed a decreased number on the late drained areas, indicating that holding the water probably reduces the number of blooms. In 1923 the number of aborted blossoms per 100 upright stems was somewhat higher on late than on early drained bogs. Although late draining reduced the number of blooms, it had a beneficial effect on the set, the computations showing 46 and 59 per cent set for early and late drained Howes and 51 and 56 per cent for early and late drained Early Blacks. A comparison of yearly yields with yearly mean temperatures showed a marked tendency for large crops to follow warm years and, conversely, for small crops to follow cool years.

Grape varieties, L. R. Detjen (*Peninsula Hort. Soc. [Del.] Trans., 38 (1924), pp. 70–77*).—Information is presented upon the color, season of ripening, sterility, and cross-compatibility of a large number of grape varieties.

Chemical investigations in regard to citrus, C. F. Juritz (*Union So. Africa Dept. Agr., Sci. Bul. 40 (1925), pp. 22*).—Chemical examinations of the juice of Navel oranges sprayed with arsenate of lead showed that the total amount of acid in the juice of sprayed fruits was only about one-third that of comparable unsprayed fruits. Determination of the pH value also indicated that unsprayed fruits were more acid than sprayed ones. In eating quality the sprayed fruits were found inferior to controls. In the case of heavily sprayed, lightly sprayed, and unsprayed fruits, the average percentages of sucrose (cane sugar) were 1.12, 3.65, and 4.14, respectively. The heavily sprayed fruits contained about one-fifth as much total acid as the untreated fruits, and were insipid in flavor. In conclusion the author points out the possibility that arsenical sprays delayed the maturity of the fruits, and suggests the need of ascertaining the exact stage of maturity of fruits submitted for analysis.

The cultivation of citrus fruits, H. H. Hume (*New York: Macmillan Co., 1926, pp. XXI+561, figs. 237*).—A comprehensive discussion, dealing with the geographical distribution, botany, culture, propagation, frost prevention, insect and disease control, etc.

The avocado: Its cultivation and distribution [trans. title], W. Popenoe (*Agricultura [Pan Amer. Union], No. 16 (1926), pp. II+19, figs. 9*).—Practical information is offered concerning pollination, culture, soil requirements, propagation, varieties, etc.

Cacao, T. Zeller (*Kakao. Hamburg: Walter Bangert, 1925, pp. [4]+165, pl. 1, figs. 6*).—A small handbook concerning the botanical characters of the plant, cultivation, fertilizing, control of fungus pests, harvesting, marketing, etc.

Improvement of guava by selection, G. S. Cheema (*Bombay Dept. Agr., Ann. Rpt. 1923–24, pp. 188, 189*).—Biometrical analyses of the yields of 129 seedling guavas growing in the Ganeshkhind Botanical Gardens, Kirkee, India, showed the following correlation co-efficients: $+0.412\pm0.049$ between the number of fruits produced in 1922 and those in 1923; $+0.171\pm0.057$ for the 1922 and 1924 yields; and $+0.272\pm0.054$ for the 1923 and 1924 crops.

Roses in the little garden, G. A. Stevens (*Boston: Little, Brown & Co., 1926, pp. [6]+118, pls. 8*).—Information of a popular nature is offered on varieties, culture, propagation, control of pests, utilization, etc.

FORESTRY

The march of growth in the Scotch pine and Norway spruce [trans. title], L.-G. Romell (*Meddel. Statens Skogsförsöksanst.* [*Sweden*], *No. 22* (*1925*), *pp. 45–124, figs. 30*).—Measurements taken weekly during four consecutive growing seasons upon the terminal growth of young trees of Scotch pine and Norway spruce at nine widely separated stations in Norrland, Sweden, showed that temperature was the most potent factor in influencing the rapidity of growth. The time of commencement of growth varied significantly from year to year in accord with weather conditions. On the other hand, the duration of the growth period was very constant. The effect of latitude of the several stations upon the time of the beginning of growth was clearly evident in Scotch pine, but not in Norway spruce, which species seemed much less susceptible to local climatic variations. The opening of buds in Scotch pines was delayed about 2⅓ days for each degree of latitude northward. Slow growth at the beginning and the end of the season made accurate determinations of the start and finish very difficult.

Among factors affecting the length of shoots in addition to temperature and rainfall, the length of the preceding growing season had a direct influence. Early springs did not materially affect the growth of the current season, but apparently lengthened the period of nutrition and thus affected the growth of the following year.

Finding that records taken with the increment borer upon diameter increases were unsatisfactory on account of the necessity of using different trees from week to week, an instrument was devised in which readings were taken directly on a graduated steel tape fastened around the trunk of the tree. Records taken with this instrument upon trees in unthinned, partly thinned, and heavily thinned stands showed slight differences due to thinning. The growth curve for thinned trees was frequently a little more convex, indicating that a greater percentage of the growth was gained in the early part of the season. Data on individual trees in the various groups showed peculiar growth responses, suggesting that each tree is affected by its environment. Readings on the steel tape instrument not only showed an earlier beginning in diameter expansion, but also recorded certain fluctuations not shown by the increment borer. The increment borer, on the other hand, shows the exact nature of the increased growth. When the instrument was left attached during the winter a significant enlargement was recorded in November, followed by an even greater contraction in midwinter, amounting to 6 per cent in the case of the Scotch pines examined.

An abstract in French is appended (pp. 117–123).

The forest trees of Ontario and the more commonly planted foreign trees: A guide to their identification, J. H. White (*Toronto: Ontario Dept. Lands and Forests, Forestry Branch, 1925, pp. 80+V, pls. 32*).—This guide contains brief descriptions of native and exotic trees growing in Ontario. To aid in identification, there are presented illustrations of leaves, fruit, dormant twigs, and frequently flowers.

[Forestry investigations in British Columbia], P. Z. Caverhill (*Brit. Columbia Dept. Lands, Forest Branch Rpt. 1925, pp. E11–E18, pls. 2, fig. 1*).—Observations upon natural reproduction in various cut-over areas in the hem-

lock-cedar type showed ample reforestation on unburned areas. Broadcast burning of slash, except where the ground is covered to an extent to prevent reproduction, delayed the reforestation several years. Surveys in Douglas fir type also showed satisfactory natural reproduction in areas not too far removed from seed trees. Seed traps placed 60 chains from parent trees caught sufficient seed to insure adequate reproduction. Indications were obtained that herbaceous cover favors the establishment of seedlings and may account for difficulty in establishing reproduction in burned cut-over areas. Data on reproduction nine years following burns on north and south slopes showed much greater success on the northern exposure. Slash burning in general delayed the formation of forest cover from three to five years. Volume tables are presented for Douglas fir, hemlock, and cedar.

Natural reproduction and selection cutting in the mountain forests of West Java [trans. title], F. Kramer (*Dept. Landb., Nijv. en Handel Nederland. Indië, Meded. Proefsta. Boschw., No. 14 (1926), pp. [3]+182+VIII, pls. 9, figs. 8*).—In West Java, forest growth is very abundant and rapid on account of the favorable environment. Records show an average yearly rainfall of 169 in., well distributed throughout the entire year. Relative humidity averages 87 per cent and the temperature 17.7° C. (63.9°F.) The soil is very fertile, consisting of a decomposed volcanic rock. The virgin forest is composed of a great number of species, good and bad, associated indiscriminately. Beneath the virgin forest little natural reproduction can occur on account of the dense overhead canopy.

Upon clearing, natural reproduction becomes exceedingly plentiful, especially in openings less than 600 sq. yds. in area. In openings of this size it was found that reproduction resulted in dense reforestation in a period of five years. Attempts to plant preferred species in these openings were usually unsuccessful on account of the competition with natural seeding. *Magnolia blumei* was one of the few species found able to establish itself. Under present costs, exploitation of the forests yields a very satisfactory return.

A German abstract of 8 pages is appended.

Measurements of the cubical contents of forest crops, M. D. Chaturvedi (*Oxford Forestry Mem. 4 (1926), pp. XV+142, figs. 16*).—Presented in two parts, the first dealing with the measurements of the single tree and the second with the measurement of the cubical contents of woods, this memoir constitutes a critical investigation into methods of measuring sample plats, with special reference to the liability to error.

A report on the rubber industry in Mindanao, F. G. Galang (*Philippine Agr. Rev., 19 (1926), No. 1, pp. 3–47, pl. 1*).—A survey showed approximately 305,000 Para and 35,000 Castilloa rubber trees in Mindanao, an island whose rainfall and temperature greatly favors rubber production. The heaviest flow of latex occurs from September to January, with lightest flow from January to April. The trees are tapped when from 4 to 6 years old, although 8 years is considered a better age. Estimates are given upon the cost of production and probable returns.

Para rubber, J. S. Camus (*Philippine Agr. Rev., 19 (1926), No. 1, pp. 49–61, pls. 15*).—Suggesting that natural conditions in southern Palawan, southern Mindanao, and the Sulu Archipelago favor the production of Para rubber, the most successful variety yet tried in the Philippines, the author discusses methods of planting, cultivation, cover crops, rates of growth, cost of production, tapping technique, the care of latex, and cooperative enterprises.

Methods of increasing yields on rubber plantations, A. H. Muzzall (*Philippine Agr. Rev., 19 (1926), No. 1, pp. 75–83, pls. 4*).—Vegetative propagation of

high-yielding trees is deemed a more feasible and rapid method of improving rubber plantations than the breeding of high-yielding strains. Budding methods are outlined. A planting plan whereby a large number of trees are set with the view of weeding out the low producers is discussed.

DISEASES OF PLANTS

Plant diseases [Ireland, 1921–22] (*Ireland Dept. Agr. and Tech. Instr., Ann. Gen. Rpt., 22 (1921–22), pp. 50, 51*).—Potato-disease work during the season was mainly applied to the so-called degeneration diseases, leaf roll and mosaic. Both are transmitted by aphids, jassids, and capsid bugs. Flax disease work, though curtailed, was continued. Apple rot studies showed the trouble to be caused by *Phytophthora syringae*. Onion mildew fungus mycelium survival was definitely established. Wheat disease investigations showed the presence in grains and upper haulms of a fungus resembling *Polyspora lini*.

The phytopathological service in the Netherlands [trans. title], N. van Poeteren (*Verslag. en Meded. Plantenziektenkund. Dienst Wageningen, No. 36 (1924), pp. 73, figs. 11*).—This account by the inspector corresponds to the twenty-fifth year of the phytopathological service in the Netherlands, giving an outline of the organization, activities, and results of the service, and listing also the personnel as regards those (including correspondents) connected with the service and the publications issued to date.

Maintained growth rates in fungus cultures of long duration, H. S. Fawcett (*Ann. Appl. Biol., 12 (1925), No. 2, pp. 191–198, figs. 2*).—In experiments previously noted (E. S. R., 49, p. 540) with citrus disease fungi, the question arose as to what effect long continued growth under nearly constant favorable conditions might have on the rate of advance of the mycelium. The earlier tests for periods of from three to six days, and especially at high temperatures, had suggested that the time factor has an important influence on the rate of growth. The results obtained in these tests led to an experiment in which two fungi were cultured in the ends of long glass tubes for about four and six months respectively, the fungi used being *Pythiacystis citrophthora* and *Diplodia natalensis*, which cause rotting of citrus fruits.

The weekly growth increments corresponding to the temperatures used show a curve similar to that given by the earlier experiments, though the position of the graph is different. The outstanding point is that these fungus cultures generally showed fluctuations in growth rate corresponding to temperature changes, about as would be expected from the data previously published, and that they revealed no significant changes in growth rate that can not be definitely related to corresponding temperature changes.

Morphological changes in Bacterium tumefaciens, M. Levine (*Science, 62 (1925), No. 1610, p. 424*).—A preliminary report is given of studies made daily for a period of 72 days of 12 subcultures of *B. tumefaciens*. Young cultures are said to show long rods which not infrequently present a beaded appearance. In the older cultures the rods tend to break up and become smaller as the age of the culture increases, until after 20 days or less the rods are replaced by faintly staining cocci with occasional slender bacilli. In many of the subcultures small lenticular bodies, about equal in length but wider than the *B. tumefaciens* rods, appear that are believed to be spores. When transferred to fresh media they germinated and gave rise to rodlike bodies not unlike *B. tumefaciens* in size.

These observations are believed to explain the difficulty associated with locating the causative organism in old crown gall tissue and also the differences in size of the organism as described by various authors.

Taxonomic studies on the genus Cercospora in the Philippine Islands, C. G. Welles (*Amer. Jour. Bot., 12 (1925), No. 4, pp. 195–218, pls. 10, figs. 4*).—It is stated that there have been reported from the Philippine Islands about 52 plant diseases alleged to be due to species of the genus Cercospora, the organisms occurring on approximately the same number of hosts.

The data here presented are claimed to show that the stress at present placed on the sizes of conidiophores and conidia and on host reaction may be misleading in the classification of these parasites. The data are claimed to show also that stimulation by a given organism may bring about different reactions on plants not widely separated as to characters and relationship. It is not assumed from this preliminary work that it is best to classify *Cercospora* spp. on a purely physiological basis. Host reaction and spore measurements must be accepted with caution as criteria. Physiological behavior in relation to host range would, it is thought, afford a more accurate and not too unwieldy a method.

The perfect stage of Cylindrosporium pomi, R. C. Walton and C. R. Orton (*Science, 63 (1926), No. 1626, p. 236*).—The authors report that they have discovered the perfect stage of *C. pomi*, and it is considered quite certainly a Mycosphaerella agreeing most nearly with the description of *M. pomi*.

A downy mildew of Mesembryanthemum [trans. title], L. Verwoerd (*Ann. Univ. Stellenbosch, 2 (1924), A, No. 1, pp. 13–23, figs. 3*).—In an account of a downy mildew of *Mesembryanthemum* spp., supposedly due to a fungus considered as a new species and named *Peronospora mesembryanthemi*, the author describes symptoms, fungus, and biological behaviors.

Observations on cereal rust during 1923 at Grignon [trans. title], C. Crépin (*Ann. École Natl. Agr. Grignon, 8 (1921–22), pp. 137–146, fig. 1*).—The observations here detailed relate to the time of appearance and intensity of development of cereal rusts, varietal resistance or sensitivity, and comparative resistance of parents and of F_1.

Black chaff of wheat in Russia, E. F. Smith (*Science, 63 (1926), No. 1629, pp. 305–307, fig. 1*).—In 1917 the author described a bacterial disease of wheat (E. S. R., 37, p. 653) and suggested that it was probably a recent introduction into this country. Later he considered it came from Russia, and subsequent reports confirm this conclusion. The disease is said to occur in a number of widely separated localities in Russia, from whence it was probably introduced into the United States with wheats imported for growing in the semiarid western regions.

Susceptibility of the bean to the virus of sugar-beet curly-top, E. Carsner (*Jour. Agr. Research [U. S.], 33 (1926), No. 4, pp. 345–348, fig. 1*).—In a previous publication (E. S. R., 43, p. 752) the author reported that on the basis of the varieties tested beans were nonsusceptible to sugar-beet curly top.

In 1924 an epidemic of a destructive bean disease occurred in Idaho that suggested the possibility of infection of beans with the virus of curly top. Seven varieties of beans commonly grown in the locality where the disease prevailed were secured, and greenhouse plantings were made of two of them. Later, plants of each variety were inoculated by placing viruliferous leafhoppers upon them, and the plants became diseased. The disease was then transferred from the affected bean plants to sugar beets. Some differences in susceptibility having been observed, all seven varieties were planted in the field, with viruliferous leafhoppers transferred to from 50 to 75 plants of each variety, and very pronounced degrees of susceptibility were found.

While certain varieties of beans seem susceptible to infection, the author states that the bean is not a favorable food plant for the insect, as all leaf-

hoppers died within 17 days after having been caged on bean plants. On this account it is believed that only in seasons when the leafhopper is relatively very abundant is serious damage to the bean crop from curly top to be expected.

Cabbage [disease] [trans. title], D. SPIERENBURG (*Verslag. en Meded. Plantenziektenkund. Dienst Wageningen, No. 35 (1924), pp. 12, pls. 9*).—Phases of cabbage disease are set forth in connection with associated or suspected organisms.

A disease of wild white clover caused by the eelworm, Tylenchus dipsaci (Kühn) Bastian, W. M. WARE (*Ann. Appl. Biol., 12 (1925), No. 1, pp. 113–119, pl. 1*).—Wild white clover (*Trifolium repens*), grown in the open for experimental purposes at Wye and elsewhere, showed in 1921 and later attacks by nematodes with varying results, and a study was made in this connection of the organism (*Tylenchus dipsaci*) which is thought to be partly responsible for the lack of permanence of some white clover strains. In tests of the susceptibility shown by various clovers to the attacks of the eelworm from wild white clover, remarkable resistance was shown by red clovers and the maximum susceptibility by cultivated white clovers. The suggestion is made that in future tests of the relative susceptibility of various plants to attack by this parasite, the former hosts of the eelworm should be taken into account.

Corn root rot—a soil-borne disease, W. D. VALLEAU, P. E. KARRAKER, and E. M. JOHNSON (*Jour. Agr. Research [U. S.], 33 (1926), No. 5, pp. 453–476, figs. 10*).—The object of this paper is said to be to point out the fact that there is a root disease of corn distinct from seedling blight, and that the organisms commonly considered as etiological factors in corn root rot are probably not concerned in the problem.

A report is given on soil and sand cultures conducted in an attempt to differentiate the various types of injury caused by the usually accepted corn root rot organisms. In this work *Gibberella saubinetii, Fusarium succisae, F. moniliforme,* and a composite of 42 cultures of Fusarium were found to cause but slight injury to the seedlings, and *Diplodia zeae* was not obtained in the pot cultures. The authors believe that these fungi occur only as secondary invading organisms.

Free-hand sections of rotting corn roots grown in infected soils, or in sand cultures inoculated with rotten corn roots, were found to consistently reveal a large diameter, generally nonseptate organism, and numerous oospores of the Pythium type. The roots of corn plants grown in continuous corn soil, in virgin forest soil, or in sand to which rotted corn roots from the field had been added, developed lemon-yellow discolorations, and the roots were found to be penetrated by a fungus similar to the mycorrhizal fungus described by Jones (E. S. R., 52, p. 746). The authors state that the organism causing this disease bears some resemblance to a similar fungus that causes the cane root rot, and that rotted corn roots added to sand cultures of tobacco are capable of causing a type of injury which appears identical with the so-called brown root rot of tobacco in the field.

The downy mildew of the hop and its epidemic occurrence in 1924, E. S. SALMON and W. M. WARE (*Ann. Appl. Biol., 12 (1925), No. 2, pp. 121–151, pls. 3, figs. 2*).—An account of earliest recorded appearances in various countries of hop downy mildew since what is alleged to be its earliest appearance in Japan, 1905, and of its description by K. Miyabe and Y. Takahashi, is followed by an outline of critical studies on the causal fungus (*Pseudoperonospora humuli*). A description of the fungus and of the characteristics shown on cultivated hops are given. No difference appears in the measurements of conidia and oospores in English, Japanese, and American material.

The downy mildew of the nettles, *Urtica urens* and *U. dioica*, known as *Peronospora urticae*, should, it is claimed, be referred to the genus Pseudoperonospora. Hop downy mildew can be transferred to *U. urens* and *U. dioica*, and it is thought that the reverse transfer may be made. Hypotheses are advanced to account for the appearance of this fungus locally on cultivated hops.

"Pollu" disease of pepper (*Planters' Chron., 19 (1924), No. 18, pp. 286, 287*).—Pepper, a valuable crop in Malabar cultivated largely on slopes and heights, is subject to a disease called pollu, meaning empty or hollow berries, causing losses running as high as from 50 to 75 per cent. Two insects appear to act as carriers of the infection, the causal organism of which has been identified as a Colletotrichum. This is found to attack leaves, runners (stem), spikes, and berries, the virulence varying with soil, weather, and shade. Results of spraying with 0.5 to 2 per cent Bordeaux mixture are encouraging.

Report of research committee [on potato diseases], F. Weiss and P. Brierley (*Potato Assoc. Amer. Proc., 10 (1923), pp. 21–31*).—A summary is given of the status of investigation regarding parasitic diseases of the potato, with special reference to advances made during 1923. The literature cited comprises 37 titles.

Advances in the study of the virus diseases of Irish potatoes in 1923, D. Folsom (*Potato Assoc. Amer. Proc., 10 (1923), pp. 39–42*).—A review considering mainly important new discoveries, as embodied in the 1922-1923 literature of potato virus diseases, deals very briefly with their nomenclature, etiology, symptoms, and control. The literature cited includes 28 titles.

A potato necrosis resulting from cross-inoculation between apparently healthy potato plants, E. S. Schultz (*Science, 62 (1925), No. 1616, pp. 571, 572*).—A preliminary account is given of investigations that indicate the possibility of apparently healthy potato plants transmitting a type of necrosis to other healthy plants.

Some observations on the control of rots contracted by cut seed potatoes in cold storage, J. S. Gardner (*Potato Assoc. Amer. Proc., 10 (1923), pp. 187–190*).—Experience and suggestions, as here detailed, indicate that dry chilling at a temperature close to 45° F. of sound potato seed carefully handled before and after cutting, with temperatures between 35 and 37° if removed to storage, will probably eliminate amongst all seed potato storage rots.

Potato scab control investigations, W. H. Martin (*Potato Assoc. Amer. Proc., 10 (1923), pp. 127–139, fig. 1*).—Soils having a pH value as low as 5.2 rarely produce scabby potato tubers. Of the acidity-producing agents tried, sulfur appeared to be the most satisfactory. The results of tests indicate that where scab is severe and where the correct amount of sulfur is applied properly, a considerable reduction of scab may be expected. Sulfur controls scab largely through its oxidation to sulfuric acid and resulting increase of soil acidity. Preliminary tests indicate that the size of the sulfur particles influences oxidation rate. The presence of sulfofying microorganisms (*Thiobacillus thiooxidans*) is regarded as of great importance in determining the rate and amount of oxidation. Data are presented as obtained from inoculated sulfur, sulfur with and without fertilizer, residual effect of sulfur on scab, and the influence of soil and seed treatment on scab development.

Evidently, sulfur must be used with caution, and in those instances in which the soil is already acid, or where there is only a trace of scab, other measures should be used. However, where scab is severe the correct amount and proper application of sulfur should reduce potato wart considerably.

Soil treatment for potato scab-control, O. Schreiner and B. E. Brown (*Potato Assoc. Amer. Proc., 10 (1923), pp. 139–156, pls. 2*).—The influence of soil

treatments upon potato scab control was studied in connection with the soil types Sassafras loam on Long Island and DeKalb stony loam in Pennsylvania. Data from these and other studies are briefly indicated.

Effect of sulfur and acid fertilizers on scab in California, J. T. Rosa (*Potato Assoc. Amer. Proc., 10 (1923), pp. 157, 158*).—"The outstanding result of the experiment was that the amount and severity of the scab infection was greatly reduced by both forms of sulfur and by sulfate of ammonia."

Some observations on the use of sulfur to correct scab in potato land in Kentucky, J. S. Gardner (*Potato Assoc. Amer. Proc., 10 (1923), pp. 158–161*).—"In all there have been some 15 cooperators in the testing of sulfur for scab control in the soil. . . . Certainly our data, gathered carefully enough to be authoritative, point to the efficacy of sulfur in this regard."

Some experiments with sulphur as a control for potato scab, J. C. Graham (*Potato Assoc. Amer. Proc., 10 (1923), pp. 161–165*).—"From the foregoing statement of results it would seem that the pH of the soil is not the controlling factor. . . . *Undoubtedly in the* Winnipeg experiment the sulfur was directly responsible for controlling scab. This effect was apparently accomplished by the oxidation of the sulfur since the inoculated sulfur gave slightly better results than the uninoculated."

The present status of investigation of potato wart and a consideration of its economic importance, F. Weiss (*Potato Assoc. Amer. Proc., 10 (1923), pp. 31–38*).—Potato wart (*Synchytrium endobioticum*) is said to have been known for more than 25 years and to have been reported from about 16 countries. These (broadly speaking) include most of the northern European States, Newfoundland, Canada, Natal, and the United States north of the thirty-fifth parallel and within about 300 miles of the Atlantic coast. This disease can survive generally wherever the conditions are not inimical to the potato itself. It is favored by cool weather and abundant moisture. *Solanum nigrum* and *S. dulcamara* serve also as hosts. The discovery or development of a number of immune potato varieties has largely nullified the need for preventive soil treatments, but data regarding several of these treatments are given. Most of these treatments are cheaper and more convenient than the one applying steam to the soil.

Potato wart, R. E. Hartman and W. A. McCubbin (*Penn. Dept. Agr. Bul. 394 (1924), pp. 28, figs. 9*).—Potato wart, its introduction into America, and its spread are described. Breeding research is thought to give promise of the ultimate production of an immune variety to replace the popular but susceptible variety Rural.

Infection experiments with wart disease of potatoes, Synchytrium endobioticum (Schilb.) Perc., M. D. Glynne (*Ann. Appl. Biol., 12 (1925), No. 1, pp. 34–60, fig. 1*).—This article is said to embody results of a somewhat empirical study of some of the conditions and factors controlling infection by potato wart disease. The attempt was made to find a reliable method of pot experiment to serve as a basis in soil sterilization research and a method for testing immunity or susceptibility more rapidly than is at present done in the field.

A very high degree of soil moisture is necessary to insure infection, and this appears to be most effective when occurring about the second month of growth. High percentages of infection were obtained in soils varying greatly in physical character. Under pot experimental conditions, the organism (*S. endobioticum*) survives in soil in absence of potato for at least a year. Apparently a dormancy period of about six weeks occurs between soil infection and sporangial germination. Under favorable conditions from 80 to 100 per cent of the plants became infected within three months, even in varieties which

in the field appear least susceptible. Immune varieties showed no infection under any conditions. In trials with other plants, small warts appeared on three varieties of tomato and on *Solanum nigrum* and *S. dulcamara*, but none on five other varieties of tomato, on *Datura stramonium*, *Salpiglossis sinuata*, *Hyoscyamus niger*, *Atropa belladonna*, *Lycium chinense*, or on many common weeds grown in infected soil.

A method is described for infecting sprouting tubers with wart disease by means of summer sporangia. Susceptible varieties subjected to this treatment develop young warts within three weeks, while immunes remain clean. The method can, therefore, be used for testing immunity or susceptibility in the laboratory.

The treatment of wart disease of potatoes with sulphur, W. A. ROACH and W. B. BRIERLEY (*Science, 63 (1926), No. 1629, pp. 307, 308*).—Preliminary experiments having indicated that the wart disease of potatoes might be controlled by applications of sulfur, the authors again applied sulfur at the rate of from 5 to 15 cwt. per acre, the applications being made either in the spring or autumn. Potatoes planted in untreated plats grew well and were heavily infested. In the treated plats tubers planted in May and another lot in July almost entirely failed to grow. The surviving plants showed in all plats considerable amounts of wart disease, although less than in the control areas. In one trial 2 tons of sulfur per acre was applied. The potato crop was damaged, and a considerable amount of wart disease was present. The authors state that it is clear that the sulfur treatment can not, in the absence of further information on the soil and other factors involved, be regarded as a reliable method for freeing soil of the parasite causing wart disease.

Potato degeneration [trans. title], V. DUCOMET (*Ann. École Natl. Agr. Grignon, 8 (1921–22), pp. 96–136*).—From this examination of facts and opinions it is concluded that potato degeneration is still an unsolved problem as to its real nature and causation.

Diseases of soy beans which occur both in North Carolina and the Orient, F. A. WOLF and S. G. LEHMAN (*Jour. Agr. Research* [*U. S.*], *33 (1926), No. 4, pp. 391–396*).—The authors report that the following diseases of soy beans are known to occur both in the Orient and in North Carolina: Wilt (*Fusarium tracheiphilum*), mildew (*Peronospora manshurica*), brown spot (*Septoria glycines*), pod and stem blight (*Diaporthe sojae*), anthracnose (*Glomerella glycines*), Cercospora leaf spot (*C. daizu*), and bacterial blight (*Bacterium sojae*).

Soy-bean anthracnose, S. G. LEHMAN and F. A. WOLF (*Jour. Agr. Research* [*U. S.*], *33 (1926), No. 4, pp. 381–390, figs. 3*).—In a previous publication the authors tentatively referred the causal organism of a soy bean anthracnose observed in North Carolina to the fungus *Glomerella cingulata* (E. S. R., 53, p. 746). Further study has led to the conclusion that the disease is identical with one reported in Korea that is ascribed to be due to *Colletotrichum glycines*, the ascogenous form of which is here described as *G. glycines* n. n.

The disease is said to be characterized by the presence of numerous black acervuli uniformly scattered over the surface of the affected parts. It causes premature death of the plants and failure of the pods to fill properly. The organism is seed borne, and it exists as a mycelium within the seed and as spores adhering to the exterior. The ascogenous stage was found on diseased stems which overwintered in the field, and it was developed in cultures.

Brown-spot disease of soy bean, F. A. WOLF and S. G. LEHMAN (*Jour. Agr. Research* [*U. S.*], *33 (1926), No. 4, pp. 365–374, figs. 9*).—A detailed account is given of investigations of a disease of soy beans caused by *Septoria glycines*,

the occurrence of which in North Carolina has been noted previously (E. S. R., 53, p. 746).

This disease, which is commonly called brown spot, is said to have been described first in Japan in 1915, and it is known to occur in Manchuria, Korea, North Carolina, and Delaware. It appears to be seed borne, and pathogenicity of the organism has been established by artificial inoculation. No ascogenous stage of the fungus is known. The conidia are said to remain viable during winter on decaying stems and leaves.

Pythium root rot of soy bean, S. G. LEHMAN and F. A. WOLF (*Jour. Agr. Research [U. S.], 33 (1926), No. 4, pp. 375–380, figs. 2*).—In further reference to a root rot of soy beans caused by a species of Pythium previously reported (E. S. R., 53, p. 746), a description is given of the disease. The causal organism is believed to be *P. debaryanum*. The disease is characterized by the presence of necrotic wet-rot lesions, which involve the stems and roots near the ground level and cause the plants to wither and die.

Bacterial leafspot on Hubbard squash, M. K. BRYAN (*Science, 63 (1926), No. 1623, p. 165*).—The attention of the author was called in August, 1925, to leaves of Hubbard squash which were thickly covered with angular spots, strongly suggesting the angular leaf spot of cucumbers. Bacteria were found in abuandance in the spots, but cultures did not yield anything resembling *Bacterium lachrymans*, the cause of the leaf spot of cucumbers. Isolations were made of the organism, and culture experiments showed it differed materially from any of the described species. The name *B. cucurbitae* n. sp. is suggested for the organism.

Seasonal and regional variations in curly-top of sugar beets, E. CARSNER (*Science, 63 (1926), No. 1625, pp. 213, 214*).—Attention is called to the varying severity of curly top of sugar beets in California and the intermountain region of the Northwest in 1924 and 1925. By correlating the climatic data for the preceding winters evidence was secured that is said to strongly support the idea that the abundance or scarcity of beet leafhoppers, and presumably also the amount of curly-top disease in the sugar beet fields, is determined by the climatic conditions of a given area rather than that the severe outbreaks occur simultaneously throughout the range of the insect at periodic intervals.

Stem injury of tobacco, W. B. TISDALE and J. G. KELLEY (*Florida Sta. Bul. 182 (1926), pp. 277–286, figs. 6*).—The authors report having observed for several years, especially in 1925 and 1926, tobacco plants which were dwarfed, chlorotic, with their lower leaves spotted, and with brown to black lesions on the basal portions of the stems. Field examinations showed that all affected plants had, in contact with the stems, lumps of corn meal and lead arsenate which had been used for controlling bud worm, but experiments indicated that the injury was not due to lead arsenate. Cultures were made of the poison mixture, and *Aspergillus oryzae*, *A. niger*, and a species each of Mucor and Penicillium were obtained. Experiments in which cultures of the fungi in Petri dishes were placed in contact with stems of vigorous tobacco plants showed that the plants treated with cultures of Aspergillus were completely girdled, while those treated with cultures of the other fungi showed little injury.

Inoculation experiments in which fragments of pure cultures of the organisms were inserted in the stems showed slight discoloration where Aspergillus was introduced, but after two weeks the wounds had calloused over and showed no signs of fungus invasion.

It is believed that the injury described above is of an indirect nature, perhaps due to a by-product of the fungi growing on the corn meal.

Tobacco and tomato mosaic, B. T. DICKSON (*Science, 62 (1925), No. 1609, p. 398*).—The author reports the expressed juice of mosaic-diseased tobacco

plants as infectious, as shown by inoculation experiments, after having been kept for more than five years in a tightly stoppered bottle.

Investigations of the streak or stripe disease of tomato plants by T. C. Vanterpool are said to indicate that the disease as it occurs in Quebec is due to a double inoculation with the virus of potato mosaic and tomato mosaic, and not to *Bacillus lathyri* as has been claimed (E. S. R., 44, p. 647).

The transfer of tobacco and tomato mosaic disease by the Pseudococcus citri, P. K. OLITSKY (*Science, 62 (1925), No. 1611, p. 442*).—As a result of greenhouse studies with tobacco and tomato plants, the author concludes that spontaneous mosaic does not occur in healthy or injured tobacco or tomato or in these plants injected with nonmosaic materials, nor is the disease seed borne.

In experiments with tobacco and tomato seedlings, in which a large number of plants were raised, an infestation of the greenhouse with *P. citri* was followed by a spread of typical mosaic disease to uninjured or uninoculated plants. Extensive experiments showed that the mealy bug acted as a carrier of the disease, and it is suggested that care should be taken to eliminate *P. citri*, which is a carrier of the mosaic virus in greenhouses in the same way as are the Aphididae in the field.

Apple blotch control, L. R. HESLER (*Tenn. State Hort. Soc. [etc.] Proc., 19 (1924), pp. 49–54, fig. 1*).—The requirements of a spray to be effective under Tennessee conditions are fairly well met by Bordeaux mixture, which should be applied thoroughly every year and accurately timed. Lime sulfur does not seem to be strong enough where blotch is troublesome. Bordeaux mixture should be, for a first spray, of 3–4–50 strength, for later applications 4–5–50.

Burr-knot of apple trees: Its relation to crowngall and to vegetative propagation, C. F. SWINGLE (*Jour. Heredity, 16 (1925), No. 9, pp. 313–320, pl. 1, figs. 3*).—On stems of healthy, vigorous apple trees of commercial varieties burrknots occur, these being actually young roots. Such occurrence is a varietal character, distinct from the hairy-root form of crowngall (*Bacterium tumefaciens*). Apple individuals and even varieties may be discarded, without justification, on account of these growths. Nearly half of 500 varieties examined showed some tendency toward burrknots, each variety showing varietal consistency in this character.

Burrknots first appear on branches from 2 to 25 years old according to variety, pushing out the bark and affording a strict varietal character.

"In all plant layerage and stem cuttage the process of rooting is either (a) a continuation of the growth of roots already differentiated, or (b) the actual differentiation from meristematic tissue of such roots, followed by the later development of these differentiated cells. The former process is the more common and by far the easier to bring about in propagation. The dormant roots in the burrknots of apple varieties grow rapidly under layerage, and at least for some varieties, if planted as cuttings."

Concentration of materials and rate of application in the control of apple scab, W. C. DUTTON (*Michigan Sta. Tech. Bul. 76 (1926), pp. 3–18*).—Comparisons were made of the relative efficiency of Bordeaux mixture 2–4–100 and 6–12–100 and three strengths of lime sulfur 1.5–100, 2.5–100, and 3–100. Lead arsenate was added to all the mixtures. Light, medium, and heavy applications were made of the different strengths of mixture in accordance with a definite spray program.

The results of the experiments are said to show that both Bordeaux mixture and lime sulfur may be depended upon to give good control of apple scab if properly used, but that neither is entirely satisfactory, as Bordeaux mixture may cause russeting of the fruit and lime sulfur may burn the leaves under

some conditions. According to the author, lime sulfur is preferable under Michigan conditions.

The author claims that there is a definite relation between the amounts of active ingredients applied and the control of scab attained. An increase in the amount, regardless of concentration or dosage, results in a smaller proportion of scabby apples, but increases beyond the optimum result in relatively small reductions in the amount of scab.

Samples of leaves were collected at three periods during the season and the residues of spray materials determined. These determinations indicate that with the strength of material constant the residues increase with the dosage, and with dosage constant the residues are greater with increases in strength of material. The addition of casein lime to lime sulfur and lead arsenate made the sulfur more persistent but had no significant effect on the lead arsenate. The amounts of residues were found to be affected very appreciably by weathering.

The control of apple scald with shredded oiled paper, C. Brooks and J. S. Cooley (*U. S. Dept. Agr., Dept. Circ. 396* (*1926*), *pp. 4, fig. 1*).—The results are reported of three years' experiments with shredded oiled paper in the control of apple scald. Seven different varieties of apples were used in the experiments, and scald was reduced from an average of 67 per cent to an average of 4 per cent by the use of the paper. Poor distribution of the paper was found to result in poor scald control, and for complete control with susceptible varieties the authors claim that every apple should have some contact with the paper. Not less than 1.5 lbs. of paper should be used to the barrel. The paper should carry at least 15 per cent of its weight in oil, and 18 per cent or more is considered desirable. The cost of using the paper is estimated at from 20 to 25 cts. per barrel.

A blossom and spur blight of pear caused by a strain of *Botrytis cinerea*, S. M. Zeller (*Jour. Agr. Research* [*U. S.*], *33* (*1926*), *No. 5*, *pp. 477–482, figs. 5*).—A spur and blossom blight of pears in Oregon is described which is due to a strain of *B. cinerea*. The fungus is said to attack Anjou, Bartlett, Winter Nelis, Comice, and Bosc in severity in the order mentioned, and so far as the author's information goes the disease is limited to southwestern Oregon.

Cherry leaf-spot, L. R. Hesler (*Tenn. State Hort. Soc.* [*etc.*] *Proc., 19* (*1924*), *pp. 84–86*).—Bordeaux mixture at 4–4–50 controls cherry leaf spot but may cause defoliation. Lime sulfur at 1–50 controls the disease and produces less injury. It should be applied three times, about two to three weeks apart according to conditions, beginning when the leaves are well out.

Bacterial spot of peach, B. B. Higgins (*Georgia Sta. Circ. 79* (*1926*), *pp. 8, figs. 4*).—A popular description is given of the disease of peach caused by *Bacterium pruni*. For the control of this disease the author suggests careful pruning to remove all cankered twigs, the prunings to be burned; turning the soil during winter in order to cover the fallen leaves; using a fungicide as a dormant spray, lime-sulfur spray if applied the latter part of April and early in May; and heavy fertilization, especially with nitrates, to keep the trees growing vigorously.

Some coffee diseases of south India and their control, K. M. Thomas (*Planters' Chron., 19* (*1924*), *No. 41*, *pp. 697–704*).—This paper deals with the principal fungi affecting coffee culture in south India, control measures, and some salient features of coffee culture. The coffee diseases discussed include rust (*Hemileia vastatrix*), koleroga or black rot, leaf spot and die-back, root diseases, and a new disease, black bean or jollu.

Pecan scab, R. E. NOLEN (*Florida Sta. Bul. 181 (1926), pp. 249–276, figs. 8*).—A description is given of pecan scab caused by *Fusicladium effusum*, which is said to be the most serious disease of pecans. The amount of injury seems to be proportional to the rainfall. Varietal differences with regard to susceptibility are reported. The symptoms of the disease on the leaves, twigs, and nuts are described at some length, and data are given relating to the life history of the causal organism.

In addition to most varieties of pecans, several wild species of hickory are said to be susceptible to the disease.

Insect transmission and host range of aster yellows, L. O. KUNKEL (*Abs. in Science, 62 (1925), No. 1614, p. 524*).—The author has found that the aster yellows disease is spread by the leafhopper *Cicadula sexnotata*. The disease, while very specific as to its insect host, attacks a wide range of plant hosts, and it has been transmitted experimentally through the insect to 50 species representing 20 different families of plants. Great variation in symptoms is said to be shown by the disease in its different host plants, and several obscure diseases, such as bunchy top of the straw flower, yellows of several garden plants, and the Rio Grande or rabbit ear disease of lettuce were found to be identical with aster yellows and to be transmitted to these plants by the aster leafhopper. No evidence was found that the virus of aster yellows causes disease in its insect host.

The present continued development of basal shoots from blighted chestnut trees, A. H. GRAVES (*Science, 63 (1926), No. 1623, pp. 164, 165*).—Attention is called to the frequent appearance of basal sprouts from chestnut trees apparently destroyed by *Endothia parasitica*. Inoculation experiments on roots and shoots of this character have shown slight invasion of the roots while the shoots are rapidly girdled by the fungus. It is suggested that differences in tannin content of the shoots, collar, and roots may account for the differences in reaction toward the parasite.

The influence of physical factors on the viability of sporidia of Cronartium ribicola Fischer, P. SPAULDING and A. RATHBUN-GRAVATT (*Jour. Agr. Research [U. S.], 33 (1926), No. 5, pp. 397–433, figs. 17*).—The results are given of detailed studies of the influence of physical factors, especially drying, on the sporidia of *C. ribicola* from eight species of Ribes hosts.

The time necessary for the production of sporidia is said to have increased directly with the length of storage of the telial material. Temperature also influenced the time necessary for sporidial production, and water was needed for germination, but the thinnest film was sufficient for this purpose. The viability of wet sporidia was found to be decreased by bringing them to an air-dried condition and immediately rewetting them. The amount of injury increased directly with the increase in the saturation deficit of the air in which they were dried. A few sporidia were able to survive as many as 11 alternate dryings and wettings. In desiccators where the relative humidity of the air was controlled by sulfuric acid of known specific gravities, the viability of the sporidia decreased directly with increase in the saturation deficits of the air. Sporidia from *Ribes americanum*, *R. cynosbati*, *R. glandulosum*, *R. nigrum*, *R. odoratum*, *R. rotundifolium*, *R. triste*, and *R. vulgare* survived exposures of 9 or more hours in an air-dried condition. Some air-dried sporidia from *R. nigrum* survived exposure for 26 hours in air with saturation deficits between 2.2 and 3.4 mm. Small percentages of the sporidia were found to survive short exposures in full sunlight with saturation deficits up to 23.5 mm.

Some observations on root diseases of Hevea brasiliensis, A. SHARPLES (*Planters' Chron., 20 (1925), No. 6, pp. 90–93*).—The author contributes briefly

critical notes, as well as comparative studies by himself, on the characterization of organisms found in connection with root diseases of *H. brasiliensis.*

The "mouldy rot" disease of Hevea brasiliensis in Malaya, F. W. SOUTH and A. SHARPLES (*Fed. Malay States Dept. Agr. Bul. 37 (1925), pp. [2]+31, pls. 4*).—*H. brasiliensis* bark disease probably appeared first in Malaya about 1916. Black stripe has close analogies in other countries, but moldy rot appears not to have been recorded elsewhere. Though easily controlled, it has spread considerably throughout the peninsula, being disseminated readily, as on clothes. The fungus regarded as causal, *Sphaeronema fimbriatum*, was dealt with by Sharples and others in a publication previously noted (E. S. R., 44, p. 750). In the present account it is stated that other fungi, chiefly *Cephalosporium* sp., and bacteria, invariably accompany in diseased tissues *S. fimbriatum*, which is said to possess three distinct spore forms. The spread of the disease has been mapped.

The relation of moisture contents of wood to its decay, W. H. SNELL, N. O. HOWARD and M. U. LAMB (*Science, 62 (1925), No. 1608, pp. 377–379*).—A preliminary account is given of experiments conducted to determine the relation of the moisture content of wood to its destruction by fungi. Oven-dried blocks of Sitka spruce, Douglas fir, and sapwood of southern pine were subjected to definite saturations and inoculated with *Lenzites sepiaria, L. trabea, Trametes serialis, T. carnea, Fomes roseus,* and *Lentinus lepideus.*

In general, the decay taking place at moisture contents from the fiber saturation point of the wood up to a falling-off point was about the same, although with some of the fungi there was a tendency to greater decay at moisture percentages higher than the fiber saturation point. The relation of water saturation and specific gravity is discussed, and it is considered probable that the durability of some heavy woods, like white oak, best southern pine, etc., is not due to tannin, resin, or anything more than its high specific gravity, and hence a small amount of air available for fungus growth.

Control of decay and molding of wood pulp, C. A. RICHARDS ([*Tech. Assoc. Pulp and Paper Indus.*], *Tech. Assoc. Papers, 7. ser., No. 1 (1924), pp. 94–99, figs. 13*).—Technical and practical phases are discussed of dealing with organisms deteriorating wood pulp. These include pulp rot fungi, discoloring mold fungi, and one bacterium found in river water at a mill where the correlated brown spot occurs.

As regards chemical treatment, it is stated that sodium fluoride and combinations of cymene and naphthalene with beta-naphthol or paradichlorobenzene will give more satisfactory results than any other chemical treatments tested as ground-wood pulp preservatives. Except in case of severe conditions, sodium fluoride at 16 lbs. per ton of air dry pulp is sufficient as a rule.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Notes on the breeding of wood rats of the genus Neotoma, E. R. WARREN (*Jour. Mammal., 7 (1926), No. 2, pp. 97–101*).—In studying the life history of wood rats of the genus Neotoma in Colorado the author found that the round-tailed wood rats appear to have two or more litters annually, at least where the climatic conditions are favorable. The bushy-tailed wood rats have but one litter in a season, with the possible exception of the Arizona wood rat. The number of young in a litter varies from one to six, litters of the round-tailed forms apparently averaging less in number than those of the bushy-tailed rats.

Age of the animal and slope of the ground surface, factors modifying the structure of hibernation dens of ground squirrels, W. T. SHAW (*Jour.

Mammal., 7 (1926), No. 2, pp. 91–96, pl. 1, figs. 3).—This is a further contribution on the biology of the Columbian ground squirrel (*Citellus columbianus columbianus*), based upon investigations at the Washington Experiment Station (E. S. R., 54, p. 550).

A contribution to the study of the venom of spiders [trans. title], V. Brazil and J. Vellard (*Mem. Inst. Butantan, 2 (1925), No. 1, pp. 5–77, pls. 14; abs. in Jour. Amer. Med. Assoc., 86 (1926), No. 22, p. 1709*).—This is a report of studies made of the poison of five species of spiders in Brazil, namely, *Ctenus ferus* Perty, *C. nigriventer* Keys, *Trechona venosa* Latr., *Nephila cruentata* Fab., and *Lycosa raptoria* Walck. The venoms of *C. ferus* and *C. nigriventer* were found to be very active and to affect exclusively the nervous system, while that of *N. cruentata* was very weak and its action purely local. The venom of *L. raptoria* acted only locally, but was very toxic. It was found possible to prepare a serum very active against spider venom, but the serums are strictly specific and do not protect against other species. A list is given of 59 references to the literature.

The effect of the venom of some supposedly poisonous arthropods of the Canal Zone, W. J. Baerg (*Ann. Ent. Soc. Amer., 18 (1925), No. 4, pp. 471–478*).—This investigation, dealing with centipedes, scorpions, and tarantulas, has been reported briefly from another source (E. S. R., 55, p. 50).

The biology of the Protozoa, G. N. Calkins (*Philadelphia and New York: Lea & Febiger, 1926, pp. IX+17–623, figs. 238*).—Following an introduction, this work contains chapters on nuclei and kinetic elements, structural differentiations, general physiology, reproduction, special morphology and taxonomy of the Mastogophora, Sarcodina, Infusoria, and the Sporozoa, vitality, phenomena accompanying fertilization, and the effects of reorganization and the origin of variations in the Protozoa. A bibliography is appended (pp. 585–623).

The Protozoa and the problem of adaptation, L. L. Woodruff (In *Organic Adaptation to Environment*, edited by M. R. Thorpe. *New Haven: Yale Univ. Press; London: Humphrey Milford, 1924, pp. 45–66, figs. 4*).—This is a contribution by the professor of protozoology in Yale University. It includes a list of 19 references to the literature.

Biological studies on the life-cycle in the genus Strongyloides Grassi, 1879, J. H. Sandground (*Amer. Jour. Hyg., 6 (1926), No. 3, pp. 337–388, pl. 1, figs. 2*).—Folowing an introduction, the author deals with the subject under the following headings: Material and methods, the course of the life cycle displayed in experimental infections, *S. stercoralis* infections in man in the Temperate Zone and Tropics, a review of the theories previously advanced to account for the two life cycles in the genus, and studies on the sex of the parasitic generation with a suggested explanation of the mechanism determining the mode of development. A list of 38 references to the literature cited is included.

[Insect pests in Haiti], G. N. Wolcott (*Internatl. Rev. Sci. and Pract. Agr. [Rome], n. ser., 4 (1926), No. 1, pp. 187–189*).—Brief mention is made of important insect pests of cotton, coffee, sugar cane, sweet potatoes, bananas, coconut trees, and citrus trees in Haiti.

Insect pests in Argentina [trans. title] (*Min. Agr. [Argentina], Secc. Propaganda e Informes Circ. 601 (1926), pp. 54, figs. 67*).—This is a popular account of economic insects occurring in Argentina.

Plant diseases and pests in Denmark, 1924 [trans. title], E. Gram and S. Rostrup (*Tidsskr. Planteavl, 31 (1925), No. 3, pp. 353–417, figs. 2*).—In this discussion of plant diseases and pests the authors treat of the more important insects of the year.

An annotated list of the species of injurious insects and their parasites recorded in Italy up to the close of 1911, II [trans. title], G. LEONARDI (*Ann. R. Scuola Super. Agr. Portici, 2. ser., 19 (1924), [Art. 5], pp. 143; 20 (1925), [Art. 11], pp. 81*).—This is a continuation of the second part of the article previously noted (E. S. R., 52, p. 753).

[Economic insects in Sumatra] (*Bul. Deli Proefsta. Medan, 1925, Nos. 22, pp. 6; 23, pp. 55, figs. 20; 24, pp. 6, fig. 1; 25, pp. 14, fig. 1*).—The contributions here presented include No. 22, Sucking Insects on Deli Tobacco, by L. Fulmek; No. 23, Thysanoptera on Tobacco in Java and Sumatra, by H. H. Karny; No. 24, Some Aphididae of Sumatra, by R. Takahashi; and No. 25, The Small Green Tobacco Capsid of Sumatra, by L. Fulmek.

Notes on Queensland cane insects and their control (third series), E. JARVIS (*Queensland Bur. Sugar Expt. Stas., Div. Ent. Bul. 19 (1926), pp. 72, figs. 20*).—This is the third compilation of notes on sugar cane pests in Queensland by the entomologist at Meringa (E. S. R., 53, p. 857).

[Insects attacking cotton in Nigeria] (*Nigeria Agr. Dept. Ann. Bul., 4 (1925), pp. 3–108, pls. 8*).—These papers include the following: A Survey of Factors Affecting the Development of the Cotton Plant in the Oyo and Abeokuta Provinces of Southern Nigeria, by T. G. Mason and C. H. Wright (pp. 3–31); Preliminary Investigations of the Parasitism of Certain Fungi Causing Boll Rots of Cotton, by T. Laycock (pp. 32–49); Observations of the Extent of the Damage Caused by Bollworms and Stainers to the Cotton Crop in Southern Nigeria, by A. W. J. Pomeroy and O. B. Lean (pp. 50–63); A Statistical Survey of the Infestation of *Dysdercus* spp. on Cotton in Nigeria (pp. 64–81) and Observations on *Syagrus calcaratus* F. and *Helopeltis bergrothi* Reut., Minor Pests of Cotton in Southern Nigeria (pp. 82–88), both by F. D. Golding; and The Cotton Boll Worms of Southern Nigeria, by A. W. J. Pomeroy (pp. 89–108).

Fruit insect problems in southern Indiana, B. A. PORTER (*Ind. Hort. Soc. Trans., 1924, pp. 53–59*).—This is a discussion of the Oriental fruit worm, peach and other borers, cat-faced peaches, apple flea weevil, apple red bug, and the San Jose scale.

Principal insect enemies of deciduous fruits in Argentina [trans. title] (*Min. Agr. [Argentina], Secc. Propaganda e Informes Circ. 528 (1925), pp. 38, pls. 6*).—This is a practical summary of information.

[Forest insects of Sweden] (*Meddel. Statens Skogsförsöksant. [Sweden], 21 (1924), pp. 259–294, figs. 14; 295–310, figs. 14; 311–338, figs. 16*).—Accounts are given of The Injury Caused by Forest Insects during the Years 1919–1921, by I. Trägårdh (pp. 259–294); The Spruce Cone Geometrids (*Eupithecia abietaria* Götze and *E. strobilata* Hb.) and Their Injury, by P. Spessivtseff (pp. 295–310); and Studies of Anobiid Beetles, by I. Trägårdh (pp. 311–338).

Economic poisons, 1924–1925, G. P. GRAY, F. THOMPSON, ET AL. (*Calif. Dept. Agr. Spec. Pub. 58 (1925), pp. 50*).—This is a report of analyses of insecticides, etc.

California petroleum insecticides, G. P. GRAY and E. R. DE ONG (*Indus. and Engin. Chem., 18 (1926), No. 2, pp. 175–180*).—As a result of laboratory and field tests made of about 35 petroleum distillates to determine to what extent, if any, the various physical tests are significant in determining the toxicity of an oil to vegetation, it was concluded that physical tests alone are inadequate. The toxicity of the oils tested appeared to increase roughly in proportion to the amount of unsaturated compounds present. A sulfonation test (the percentage of the oil soluble in 37 N sulfuric acid) may be used to estimate the amount of unsaturated compounds in an oil and is suggested as a useful guide in

judging toxicity. The ability of an oil to penetrate plant tissue must also be taken into account.

Report on a mission to California (U. S. A.) to study new methods of fumigation of citrus trees, N. Iscander (*Egypt Min. Agr. Tech. and Sci. Serv. Bul. 62 (1926), pp. 41+7, figs. 7*).—This is a report of an inspection and study made of the fumigation of citrus trees with liquid hydrocyanic acid and of dusting with calcium cyanide in California to replace fumigation by the ordinary pot method.

Derrisol, a new aphid spray, J. R. Winston (*Citrus Indus., 7 (1926), No. 3, p. 32*).—Attention is called to the value of Derris extract, the active ingredient of Derrisol, in combating aphids. Derrisol should be diluted 1 part in 800 parts of water or spray solution.

Some diesases of Aphis spiraecola Patch, E. M. Gilbert and W. A. Kuntz (*Fla. State Plant. Bd. Quart. Bul., 10 (1925–26), No. 1–2, pp. 1–6*).—The authors point out that the scarcity of *A. spiraecola* during the period of summer rains clearly demonstrates that some factor or set of factors must be at work at this time of the year to check or destroy the aphid, and that in 1924 a disease caused by *Empusa fresenii* Nowak was probably the principal factor. Brief reference is made to the olive-brown molds of aphids on citrus (a species of Cladosporium) and to the white mold, a species of Cephalosporium.

The control of the apple capsid bug, F. R. Petherbridge and W. G. Kent (*Jour. Min. Agr. [Gt. Brit.], 33 (1926), No. 1, pp. 50–57*).—This is a report on the causes of failure to control the capsid bug on apples, which were found to be spraying at the wrong time, incorrect methods of spraying, and unsuitable water for soft soap and nicotine spraying.

The pine butterfly, Neophasia menapia Felder, J. C. Evenden (*Jour. Agr. Research [U. S.], 33 (1926), No. 4, pp. 339–344, figs. 4*).—This is a report of the results of a two years' field and laboratory study of *N. menapia* in Idaho. Outbreaks of this butterfly have been recorded from several sections of the Northwest, thousands of acres of yellow pine in Idaho being severely defoliated by it in 1922 and 1923. It has also been collected in California, is found as far east as the eastern range of the Rocky Mountains, and is apparently present in all of the pine forests in the western part of the United States and Canada. Practically all species of pine throughout the range of the insect are attacked to a greater or less extent, but the western yellow pine is the preferred host. It has also been recorded as severely injuring Douglas fir in the coast regions of British Columbia. Brief descriptions are given of its several stages, and its life history, habits, natural enemies, and economic importance are reported upon.

There is but one generation yearly in Idaho, eggs being laid in the late summer or fall, and adults, especially males, being frequently seen at high elevations as late as October. The overwintering eggs hatch about the time the new needles begin to appear on the western yellow pine, which occurs during the first half of June. The young larvae feed in clusters until about half grown. Their growth is very rapid after the second molt, and they are approximately full grown by the last of July, or about 50 days after hatching. When mature, they lower themselves to the ground and pupate as chrysalids on shrubs, grasses, limbs, fences, tree trunks, or other objects. Emergence takes place in from 15 to 20 days, and mating and oviposition quickly follow.

The area observed by the author to be defoliated in 1923 was at least 25 per cent larger than that in 1922, when the outbreak first became serious. However, there was a heavy mortality caused by natural enemies of the insect in 1923, and during 1924 it was practically impossible to find a larva and no damage was

observed that season. The most important enemy was the ichneumonid *Theronia fulvescens* Cress. A predacious hemipteran, *Podisus placidus* Uhler, was also present in large numbers, but its importance in the reduction of the pest is not known.

Acquired immunity in silkworms, R. W. Glaser (*Jour. Immunol., 10 (1925), No. 4, pp. 651–662*).—This is a report of work at the department of animal pathology of the Rockefeller Institute for Medical Research, at Princeton, N. J. The author found that acquired immunity towards a flacherie-like disease was produced in a large number of silkworms by injecting killed cultures of the specific bacillus. Susbsequent infection by feeding the living bacillus rarely produced the disease. A single treatment with vaccine so employed seemed to demonstrate some immunizing effect, but more than one treatment is necessary to obtain a pronounced effect. Acquired immunity against this disease was not produced by feeding vaccine, followed by feeding the living culture, nor was any noticed by injecting the vaccine, followed by the inoculation of a minimum lethal dose of the living culture.

Laboratory experiments with arsenicals in the control of the codling moth, E. J. Newcomer (*Jour. Agr. Research [U. S.], 33 (1926), No. 4, pp. 317–330*).—This contribution from the U. S. D. A. Bureau of Entomology discusses the results of tests under the headings of casein spreader, strength of lead arsenate, light and heavy applications of lead arsenate, paste v. powdered lead arsenate, lead arsenate in combination with lime sulfur and oil emulsions, various arsenicals, and calcium arsenate.

In conducting the investigations individual apples were sprayed and a given number of larvae placed upon them. Almost without exception, the addition of casein spreader to lead arsenate or to other arsenicals or combination sprays materially improved the control obtained. The smallest amount of casein spreader used, 2 oz. to 50 gal., gave better control when used with lead arsenate than any larger amount tested.

"Increasing the strength of the lead arsenate reduced the number of wormholes and generally increased the number of stings, the total number of blemishes being reduced very little. A heavy application of lead arsenate gave somewhat better results than a light application. No appreciable difference was observed in the effectiveness of equivalent amounts of paste and powdered lead arsenate. The addition of lime sulfur to acid lead arsenate materially reduced its efficiency, but this reduction was overcome by the use of casein spreader with the combination spray. The lime in the spreader apparently prevents or retards the usual reaction between lime sulfur and acid lead arsenate. The addition of a lubricating oil emulsion containing soap as an emulsifier produced variable results, the average being poorer than those obtained with lead arsenate alone. A lubricating oil emulsion containing casein as an emulsifier did not have this effect, the control being somewhat improved over that obtained from lead arsenate alone. Zinc arsenite was not as effective as lead arsenate. Paris green with lime or with casein spreader gave slightly better results in 1923, but in 1924 the control did not quite equal that obtained from lead arsenate. Powdered calcium arsenate gave very poor control, although four brands were tested. A paste calcium arsenate equaled an equivalent amount of powdered lead arsenate."

It is pointed out by the author that a number of tests of this nature have been made by Smith, accounts of which have been noted (E. S. R., 55, p. 355).

The European corn borer, H. E. Hodgkiss and H. N. Worthley (*Penn. State Col. Ext. Circ. 108 (1926), pp. 23, pls. 4, figs. 9*).—This practical summary of information on the corn borer includes colored plates illustrating its life [illegible] and the nature of its injury.

Observations on the response of adults of the European corn borer to light in egg laying, G. W. Barber (*Ann. Ent. Soc. Amer., 18 (1925), No. 4, pp. 419–431*).—The author's experiments led to the conclusion that constant light, increased hours of light each day, alternating light nights, or periods of a few days of life under constant light caused a considerable reduction in the number of eggs, while constant darkness or alternating dark days stimulated the production of eggs by adults under such conditions.

Pink bollworm of cotton, A. H. Kirby (*Tanganyika Ter. Dept. Agr. Rpt. 1924–25, pp. 20, 21*).—Notes are given on the occurrence of this pest in Tanganyika Territory, East Africa.

A comparative study of the poison apparatus of certain lepidopterous larvae, P. M. Gilmer (*Ann. Ent. Soc. Amer., 18 (1925), No. 2, pp. 203–239, figs. 21*).—This is a contribution from the Minnesota Experiment Station, in which the investigations are reported in connection with a review of the literature.

Notes on the influence of temperature and humidity on oviposition and early life of Anopheles, B. Mayne (*Pub. Health Rpts. [U. S.], 41 (1926), No. 21, pp. 986–990*).—In an experiment with 875 eggs, temperature changes modified the incubation of fertile Anopheles eggs to the extent that hatching took place within 24 hours at temperatures as high as 95° F. and was retarded to 30 hours under temperatures of 93°. Low temperature apparently either inhibits egg laying or affects the germination of deposited ova.

Experiments made in an attempt to determine the resistance of eggs to drying when exposed under natural conditions are reported in tabular form. Eggs of *A. quadrimaculatus* when exposed to the air on wet and drying mud were viable after periods of from 42 hours to 16 days. Eggs from the same females hatched normally in from 36 to 48 hours when placed at the same temperatures on the surface of water. Eggs of *A. crucians* when exposed in a similar manner proved to resist drying during periods of from 10 to 21 days and hatched normally after removal to water, while control eggs of this series hatched within 48 hours.

Mosquito species control of malaria, S. T. Darling (*Amer. Jour. Trop. Med., 6 (1926), No. 3, pp. 167–178*).—A preliminary field survey of a region where there was very severe endemic malaria in the rice fields of the Tjihoea Vlaagte in Java showed that *Anopheles aconita*, the anopheline carrier of the malaria, did not breed in the water of the rice fields which were under cultivation, but rather in neglected grassy irrigation ditches and grassy sodden rice paddies which were lying fallow.

Bats, bat towers, and mosquitoes, T. I. Storer (*Jour. Mammal., 7 (1926), No. 2, pp. 85–90, pl. 1*).—The author concludes that *Tadarida mexicana*, which was studied in California, does not ordinarily feed upon mosquitoes, and that its value is negligible in the control of malaria. He points out that Tadarida and malaria-bearing Anopheles have for years existed simultaneously in many of the towns of the Sacramento Valley in California without any appreciable change in the malarial index of the human population until the introduction of appropriate sanitary control measures.

Reports of the external parasites in sheep committee of the departmental research council.—I, Tests of certain swabbing dressings for prevention and treatment of sheep blow-fly attack (*Agr. Gaz. N. S. Wales, 37 (1926), Nos. 1, pp. 37–44; 3, pp. 237–244*).—This is the first part of a report of the experimental work of the Department of Agriculture of New South Wales on sheep blowflies, which has been compiled by H. R. Seddon.

Sheep blow-fly control, B. Smit (*Union So. Africa Dept. Agr. Jour., 12 (1926), No. 2, pp. 132–143, figs. 4*).—This further paper by the author (E. S. R., 54, p. 660) deals with fly traps, their construction and operation.

North American species of two-winged flies belonging to the tribe Miltogrammini, H. W. ALLEN (*U. S. Natl. Mus. Proc., 68 (1926), Art. 9, pp. 106, pls. 5, figs. 2*).—A synopsis of this tribe of dipterans, the females of which are viviparous, depositing active, motile maggots on or near their food. The maggots live in the nests of fossorial Hymenoptera, feeding on the stores provided for their young, which may be paralyzed insects or spiders or masses of pollen. The maggots are not known to be primary parasites of the young of their hymenopteran hosts, though their presence in the nests frequently results in the death of the latter. So far as the author is aware, it has not yet been conclusively demonstrated that any of these flies are the primary parasites of phytophagous insects in their native habitat. All the records investigated indicate that while the flies do breed in the bodies of such hosts, they display no interest in them until after they have become the prey of some wasp.

The relation of the seed-corn maggot (Phorbia fusciceps Zett.) to the spread and development of potato blackleg in Minnesota, J. G. LEACH (*Phytopathology, 16 (1926), No. 3, pp. 149–176, pl. 1, figs. 13*).—In this contribution from the Minnesota Experiment Station, observations extending over three years are said to have revealed a close association between the seedcorn maggot and potato blackleg. It is pointed out that this maggot is known to be parasitic on a wide range of host plants, including potatoes, and that a soft rot of attacked tissues characteristically follows its injury. The eggs of the insect are deposited on, or in, the soil near healthy seed pieces or sprouts, and they are commonly surface contaminated with plant pathogenic bacteria. The author finds that the larvae inoculate the seed pieces with the bacteria and aid the development of the disease by destroying or preventing the formation of wound cork.

"The bacteria are constantly associated with the insect, passing through the pupal stage and emerging with the adult fly in a virulent state. Pathogenic bacteria are commonly present in the intestinal tract of adult flies. The bacteria do not occur inside of the eggs. The surface of the eggs probably becomes contaminated at time of deposition, when, coated with a sticky fluid, they pass between the anal appendages. Sterile maggots, obtained from surface sterilized eggs, were not able to grow on sterile potato tubers, but grew normally when bacteria were added, showing that the bacteria are essential for the development of the maggots. The maggots developed slightly better on inoculated potato plugs than on inoculated beef-extract agar.

"Typical blackleg was produced by 'inoculating' healthy seed pieces with eggs of the seedcorn maggot. The seedcorn maggot is an agent of dissemination, inoculation, and hibernation of plant-pathogenic bacteria. The association between the bacteria and the insect appears to be one of mutualistic symbiosis, and constitutes a type of insect transmission of a bacterial plant disease not previously described. The facts presented here may have a bearing on the problem of the origin of parasitism among dipterous insects. No measures for the control of the insect are recommended, although preliminary experiments indicate that a thin coating of mercuric bichloride over the surface of cut seed pieces may be effective in preventing injury."

Fruit fly in the Stanthorpe District, H. JARVIS (*Queensland Agr. Jour., 25 (1926), No. 4, pp. 367–370*).—This is a report of further investigations of the Queensland fruit fly, *Chaetodacus tryoni* (E. S. R., 55, p. 253), including information on a new native host fruit, the passion vine (*Passiflora aurantia*), native parasites, overwintering, etc. The author also presents notes on the Solanum fruit fly (*C. tryoni solani*) and reports the discovery of the banana fruit fly, an unknown species.

[Fumigation of cotton for the boll weevil] (*Indian Cent. Cotton Com., Bombay, Ann. Rpt. 1925, pp. 32, 33*).—This is a brief report of experimental work on the fumigation of American cotton, which was brought to a close during the year. It is pointed out that cotton, whether baled or loose, rapidly absorbs a certain amount of hydrocyanic acid gas, and also rapidly loses it.

"Cotton which had been dried over concentrated sulfuric acid had a higher and more rapid absorptive power than cotton which had been placed in a moist atmosphere. The absorptive power of cotton remains practically unchanged throughout the range of temperature 86–104° F. Jute, as used for gunny coverings of cotton bales, has a much higher and more rapid absorptive power than cotton. The absorptive power of jute is not greatly affected by its moisture content. The absorptive power of jute is practically independent of the temperature."

A full account of these fumigation experiments is in the course of preparation.

Mexican bean beetle in Pennsylvania, T. L. Guyton and J. N. Knull (*Penn. Dept. Agr. Bul. 417 (1925), pp. [2]+6, figs. 9*).—A practical summary of information on this beetle, which was first found in Pennsylvania in the southwestern corner of the State in 1924.

Identification of immature stages of Indian Cerambycidae.—I, Cerambycini, J. C. M. Gardner (*Indian Forest Rec., 12 (1925), No. 2, pp. 17, pls. 3*).—Six species are dealt with.

Life history of the hickory spiral borer, Agrilus arcuatus Say, F. E. Brooks (*Jour. Agr. Research [U. S.], 33 (1926), No. 4, pp. 331–338, figs. 3*).—This paper deals with what is called the hickory spiral borer because its peculiar winding burrow is its chief injury to trees. It is of particular importance in Virginia and West Virginia, and probably occurs in Pennsylvania, New York, and Connecticut. In many instances medium-sized branches of bearing trees are killed by this borer, which reduces the crop of nuts, but the principal loss is in the injury to small trees. Young hickory trees in forests, in orchards, and on lawns, and especially in nurseries where seedlings and grafted trees are produced for planting are liable to attack, and it also feeds on the pecan.

In 26 or 27 days after egg deposition, which occurs during July and early August, the larva hatches out from an egg laid on the smooth bark of a twig, and lives as a grub in the tree for from 22 to 23 months, including two entire winters. The pupae are present in May and June, and this stage lasts about 20 days. Adults appear from May to July, are active only on warm days, and live about 2 months.

A relatively small percentage of the insects were found to be parasitized by several species of Hymenoptera, including *Labena apicalis* Cress., *Monogonogastra agrili* (Ashm.), and *Zatropus* sp. near *nigroaeneus* (Ashm.). It is thought probable that this pest may be held in check in nurseries and other plantations of small hickory and pecan trees by dusting or spraying with arsenicals, applied from the first to the last of June, according to the locality. As soon as leaves develop in the spring, the killed branches and terminals of infested young trees in nurseries and orchards should be cut from the trees a little below the dead part and burned.

Biology of the saw-toothed grain beetle, Oryzaephilus surinamensis Linné, E. A. Back and R. T. Cotton (*Jour. Agr. Research, 33 (1926), No. 5, pp. 435–452, figs. 4*).—This is a report of biological studies of the saw-toothed grain beetle, one of the best known of the cosmopolitan grain pests, much of the data being presented in tabular form. In both its larval and adult stages it attacks almost any stored food of vegetable origin, especially grain and such

grain products as flours, meals, breakfast foods, stock and poultry feeds, and copra, nut meats, candies, and dried fruits.

Adult beetles have been found to live for more than 3 years, though the majority of ovipositing females lived from 6 to 10 months. The length of the preoviposition period ranges from 5 to 8 days during the season most favorable for breeding to 207 days when climatic conditions are less favorable. The number of eggs laid by an individual was found to range from 45 to 285, and their incubation period ranged from 3 to 5 days in midsummer to from 8 to 17 days in cooler weather. The larvae developed in about 12 days under favorable midsummer conditions, in from about 4 to 7 weeks in the spring, and under less favorable conditions in 10 weeks. Larvae molt from 2 to 4 times, the majority molting 3 times. The data presented indicate a prepupal period of from 1 to 7 days and a pupal period of 6 to 21 days. Under the most favorable weather conditions the egg, larval, and pupal stages may be passed in as few as 22 days. The longest period required for the same development was 108 days, when the mean average temperature for the period was 69° F. At Washington, D. C., there are 4 or 5 generations annually, while in subtropical and tropical climates breeding is undoubtedly continuous.

A small cocoon-making hymenopteran, *Neoscleroderma tarsalis* (Ashm.), is the only known parasite of this beetle. In the adult stage the pest is quite resistant to fumigants, but it can be killed by fumigation with hydrocyanic acid gas, carbon disulfide, ethyl acetate-carbon tetrachloride mixture, or any other effective fumigant. Although an exposure of from 0 to 5° for 1 day will kill all stages, adults and larvae withstood a temperature ranging from 30 to 35° for 3 weeks. An exposure for 1 hour at 125° has killed all stages. A vacuum of 29 in. continued for 7 hours has killed adults.

A list of 36 references to the literature is included.

Anthrenus seminiveus Casey (Coleoptera), E. A. BACK and R. T. COTTON (*Ent. Soc. Wash. Proc., 28 (1926), No. 3, p. 64, pl. 1*).—The authors record injury to upholstered furniture, etc., by the larvae of *A. seminiveus*, a dermestid described from Washington, D. C., in 1916. Upon removing the covering of a divan or couch upholstered in curled hair, Spanish moss, and tow, 16,397 adult beetles and 10,002 well-grown larvae were counted.

The effect of fumigation with hydrocyanic acid gas on rust mites, W. W. YOTHERS (*Citrus Indus., 7 (1926), No. 3, pp. 14, 18*).—The author shows that fumigation with hydrocyanic acid gas kills rust mites and in all probability a majority of the eggs present. He also points out that however complete the killing may be at the time of fumigation, which is usually before February 1, the rust mites will be just as abundant in late May and June as if no fumigation had been done.

ANIMAL PRODUCTION

The sexual glands and metabolism.—III, The influence of injections of testicular or ovarian emulsions upon the nitrogen and gaseous metabolism of dogs and rabbits, V. KORENCHEVSKY (*Brit. Jour. Expt. Path., 6 (1925), No. 4, pp. 158–172*).—In continuing this series (E. S. R., 54, p. 562) metabolism experiments were conducted on 11 male and 24 female dogs and 8 female rabbits during a control period of 2 to 3 days, followed by a 2-day period when the dogs were injected subcutaneously with filtered emulsions of one ovary or one-half a testis from dogs or 0.33 gm. of corpora lutea or 2 gm. of cow's ovarian tissue. The rabbits were given three-tenths as large doses as the dogs. One or two control periods followed the injection period. Some of the experimental animals had been castrated, and others were both castrated and thyroidectomized. Some were fasted, while others were full fed during the experiments.

Data are given for the individual experiments, showing the nitrogen balances and the percentages of change in the metabolism during the injection and the following control period. The rabbits and dogs showed some differences in their response to the injections. Injection of the testis emulsions caused a slight decrease in the nitrogen metabolism in rabbits, but an increase in castrated and castrated and thyroidectomized dogs. The nitrogen metabolism dropped below normal in the following control periods. The gaseous metabolism was very slightly or not at all altered in dogs and rabbits. Injections of ovarian emulsious did not affect the gaseous metabolism, but ovaries without corpora lutea increased the nitrogen metabolism of castrated and castrated-thyroidectomized bitches. When the ovaries contained corpora lutea there was a decrease in the nitrogen metabolism. The injections of corpora lutea emulsions generally lowered the nitrogen metabolism, but in 2 castrated bitches the nitrogen metabolism was increased.

The author concludes from the experiments that constant changes in metabolism are not always associated with the removal of sexual glands nor with injections of these glands, but the usual effects produced indicate that the changes in metabolism are not only due to the direct influence of the sexual gland but also to the secondary action of the thyroids, hypophysis, adrenals, and pancreas.

The sexual glands and metabolism.—IV, The influence of injections of emulsions of testes and prostate and of insulin-like testicular extracts upon the nitrogen metabolism of normal, castrated, and thyroidectomized rabbits, V. Korenchevsky and M. Carr (*Biochem. Jour., 19 (1925), No. 5, pp. 773–782*).—In continuing this series, 23 metabolism experiments were conducted on 12 rabbits, of which 4 were castrated, 4 thyroidectomized, 3 both castrated and thyroidectomized, and 1 normal. The nitrogen intake and outgo were measured as in a previous study (E. S. R., 52, p. 166) during periods prior to and following injections of testicular and prostate emulsions and insulin-like extracts of bull's testes for 3-day periods.

The results showed that the testes emulsions and insulin-like extracts of the testes produced only a slight fall in the nitrogen metabolism of normal and castrated animals. When the thyroids were present, injections of the prostate gland increased nitrogen metabolism, but without the thyroids there was no effect. It appears "that the prostate emulsion produced its influence upon the nitrogen metabolism of rabbits indirectly through the thyroid gland. This mechanism is not found to work with the testicular emulsion, which . . . increases the nitrogen metabolism of thyroidectomized as well as that of normal and castrated animals."

The influence of testes on metabolism, E. P. Buchee and A. Simond (*Amer. Jour. Physiol., 75 (1926), No. 3, pp. 542–547, fig. 1*).—The basal metabolism was determined, using a modification of the portable Benedict respiration apparatus, on 1 male and 1 female dog for 1 month after the animals had been trained to lie quietly on the table. The male was then castrated, and the metabolism of both animals was again determined for 16 months thereafter. As a decrease in the metabolism in both animals was apparent during this period, special provisions for exercise were given for 10 weeks without any noticeable effect on the metabolic rate. The castrate showed a decrease of 44 per cent in the calories per hour per unit of body surface during the 16 months, while the female showed a decrease of 35.4 per cent in the same period. It is believed that factors other than castration were responsible for lowering the rate of metabolism, as the normal female showed a decrease comparable to that of the castrated male.

Cholesterol and phosphatide metabolism in pregnancy, E. J. Baumann and O. M. Holly (*Amer. Jour. Physiol., 75 (1926), No. 3, pp. 618–632, figs. 2*).—The cholesterol and phosphatides present in the blood of rabbits and dogs have been determined quantitatively. The results showed that both the cholesterol and phosphatides decreased during the last half of pregnancy to nearly half the nonpregnant level in rabbits. Thyroid deficiency in adults and fetal rabbits resulted in a rise in these substances, but pregnancy completely overcame this effect in goitrous or thyroidectomized individuals. Rabbit embryos had a higher content of cholesterol and phosphatides in their blood than their dams.

Analyses of the bile of normal and pregnant rabbits did not indicate, as has been suggested, that the liver tends to prevent the excretion of cholesterol during pregnancy. The opposite effects of pregnancy on the cholesterol and phosphatide content of the blood of man and rabbit are pointed out. In the dog, pregnancy did not appear to affect the blood lipoids.

Cholesterol and phosphatide distribution in some tissues of pregnant and nonpregnant rabbits, E. J. Baumann and O. M. Holly (*Amer. Jour. Physiol., 75 (1926), No. 3, pp. 633–639*).—The fat, cholesterol, and phosphatide content of embryos in 4 rabbits, the placentas and amniotic fluids in 3, the mammary glands of 8, and the heart and kidney of 8 normal and 8 pregnant rabbits were determined. The increases in the cholesterol and phosphatide contents of the new tissues or tissues especially functioning during pregnancy are shown to be sufficient to account for the decreases in the cholesterol and phosphatides of the blood which were found in the above paper to occur during pregnancy.

Feeding trials with velvet beans (*Rhodesia Agr. Jour., 23 (1926), No. 2, pp. 151–158*).—Analyses are given of a sample of velvet beans shipped from Rhodesia to England, together with the brief results of feeding tests carried out with swine, sheep, and calves.

In a test with swine at the Southeastern Agricultural College, Wye, a ration of 70 per cent barley meal, 15 per cent sharps, 5 per cent pea meal, and 10 per cent velvet bean meal was palatable, and the pigs made normal growth. Swine, sheep, and calves were fed in tests at the University School of Agriculture, Cambridge. A ration of bean meal, corn, and sharps, 1:2:1, fed as a slop, produced an average daily gain of 1.49 lbs. per head during a 28-day period, following an initial feeding period of 14 days on the same ration.

In experiments with two sheep whole velvet beans did not appear to be palatable at first, but they were later eaten readily, and cracked velvet beans were found to be palatable.

Two calves were given rations containing one-third bean meal. The bean meal in the ration of one was made from ordinary English beans, while velvet beans were used in the ration of the other. The calf receiving the latter ration did not do well and scoured frequently.

New and old silage crops and silage methods tested at the Dominion Experimental Station, Lacombe, Alta., G. E. de Long (*Sci. Agr., 6 (1926), No. 7, pp. 236–242, figs. 3*).—In tests at the Dominion Experimental Station, Lacombe, oats and sunflowers alone and when sowed together were compared as silage crops. The determinations included the green and dry yields of the crops and the analyses of the silage. The results of the 1-year experiment indicated that oats and sunflowers seeded in equal amounts by weight produced larger dry-matter yields per acre, and that the quality of the silage was superior to that of silage made from sunflowers alone.

Tests were also made of the keeping qualities of sheaf oats and sheaf sunflowers in a stack silo. The sheaf oats produced a dark-brown silage having

a very strong, pungent odor. The sunflowers did not keep so well. The author expresses the opinion that the mixed sunflower and oat silage would make better stack silage than sunflowers alone.

The use of molasses in the feeding of animals [trans. title], W. E. Cross (*Estac. Expt. Agr. Tucumán Circ. 13 (1925), pp. 19, figs. 3*).—Recommendations for feeding molasses, including general information on the digestibility of feeds and the nutrient requirements of livestock, are given.

The domestic animals of Roumania, G. K. Constantinesco (*Internatl. Rev. Sci. and Pract. Agr. [Rome], n. ser., 3 (1925), No. 4, pp. 972–981, pls. 13*).—A brief account of the breeds of horses, cattle, sheep, goats, swine, and poultry found in Rumania, including reference to the Government encouragement to the breeding of livestock.

Growth observations on Murnau-Werdenfelser cattle during the first year with regard to the nutrient requirements [trans. title], O. Günzler (*Ztschr. Tierzüchtung u. Züchtungsbiol., 5 (1926), No. 2, pp. 153–226, pls. 12, figs. 5*).—The first portion of this paper gives the individual weights and various body measurements of 1 bull, 2 heifers, and 2 steer calves for each week from birth to 38 weeks and at 1 year of age and includes a discussion of the percentage gains during different intervals. The second portion of the paper gives the feed consumption of the calves, including calculations and discussions of the relative efficiency of the utilization of the feed and comparisons with other breeds of cattle in nutrient requirements for growth.

The ox stomach: Some facts which cattle owners should know, R. S. Amadon (*North Dakota Sta. Bul. 196 (1926), pp. 16, figs. 3*).—An account of the processes occurring in different portions of the ox stomach during rumination and digestion is given, based on the results of observations made through an opening into the paunch cavity of 20 cattle, which included cows, bulls, steers, and nursing calves, some of which were under observation for a period of two years.

Grazing heifers on stump land pasture, M. J. Thompson (*Minnesota Sta., Duluth Substa. Rpt. 1924–1925, p. 31*).—A table is presented showing that for the 10 years over which this experiment has been conducted (E. S. R., 51, p. 677) the average pasturing period has been 143 days (June 1 to October 21) with 7.66 head of cattle, averaging 14.48 months of age. The cattle made an average daily gain of 1.14 lbs. It is pointed out that the pasturing period could often be considerably extended by day pasture, which usually continues for at least one month after the cattle are kept in the barn at night.

Self-feeding versus hand-feeding sows and litters, E. Z. Russell and J. H. Zeller (*U. S. Dept. Agr., Farmers' Bul. 1504 (1926), pp. II+6, figs. 3*).—In experiments conducted at Beltsville, Md., during 1921 and 1922, 55 sows were self-fed with their litters on pasture after the pigs reached an average age of 29.62 days, and the results of this method of feeding were compared with the results of hand-feeding 22 sows and their litters with similar grains on pasture after the pigs had reached an average age of 31.73 days.

The data showed that the self-fed sows made an average gain of 12.77 lbs. and their pigs 20.38 lbs. for an average test period of 41 days. The hand-fed sows lost an average of 11.59 lbs. and the pigs made an average gain of 17.01 lbs. during an average period of 44.33 days.

The feed required per 100 lbs. of gain of the sows and litters combined was 441.06 lbs. in the self-fed lot and 603.09 lbs. in the hand-fed lot. The average litter size of the former group was 6.5 and of the latter group 7.1 pigs at the start of the experiment.

It is also pointed out that of the 42 self-fed sows which were bred before the pigs were weaned 81 per cent settled at the first service, but only 47 per cent of the hand-fed sows settled at the first breeding.

The self-feeding of sows and litters has been successfully practiced during 1923, 1924, and 1925. Weaning has been accomplished in a very satisfactory manner by allowing the pigs only to reach the self-feeder, thus cutting down the sow's milk supply, while the pigs became more and more accustomed to the grain feeding. Further data showed that pigs raised on self-feeders continued to make larger gains after weaning than pigs which were hand-fed with their dams.

Whey research factory at Haslington: Pig feeding experiments with lactose residues, J. GOLDING and W. B. MORRIS (*Jour. Min. Agr. [Gt. Brit.], 32 (1926), No. 10, pp. 911–918, figs. 2*).—After the separation of lactose by crystallization from concentrated whey as practiced at the whey research factory at Haslington, the residue has been concentrated to a paste or made into a dry feed by mixing with brewers' and distillers' grain. The nutritive values of the dry feed and paste were each studied in 2 experiments with swine.

In the first experiment 8 pigs averaging 35 lbs. in initial weight were fed for 167 days in 2 lots on a ration of barley meal 45 per cent, sharps 30, bean meal 15, and lactose feed 10 per cent from the first to the fiftieth day of the experiment, after which the amount of bean meal was reduced and the sharps increased 10 per cent. Two other lots of similar pigs were given a control ration consisting of the same feeds except that an equivalent amount of bean meal replaced the lactose. The control pigs made an average daily gain of 0.92 lb. per head and required 3.48 lb. of dry matter in the feed per pound of gain. The lot receiving the lactose feed made an average daily gain of 0.97 lb. per pig and required 3.39 lbs. of dry matter in the feed per pound of gain.

In a second experiment lasting 87 days, rice meal and meat meal were included in the rations, and the bean meal and lactose feed made up 8 and 12 per cent, respectively, of the experimental ration. The pigs receiving the lactose made an average daily gain of 0.65 lb. per head and required 3.6 lb. of dry matter per pound of gain, while the pigs on the control ration made an average daily gain of 0.59 lb. per head and required 3.8 lbs. of dry matter per pound of gain. Supplementing the above experiments, 4 gilts were sastifactorily raised on a ration containing 14 per cent of lactose feed.

The value of lactose paste was compared with bean meal in 2 experiments. Fourteen pigs finished in the first of these on the control ration of barley 40 per cent, butter bean meal 20, sharps 20, and rice meal 20 per cent made an average daily gain of 1.06 lbs. per head, but when 8 oz. of lactose paste replaced 3.6 oz. of bean meal per pig daily, the average daily gain was increased to 1.36 lbs. The second experiment was conducted with 16 pigs of relatively poor quality. The basal ration consisted of 60 per cent barley meal, 30 per cent sharps, 5 per cent bean meal, and 5 per cent meat meal, and in the experimental ration one-half of the sharps was replaced by lactose paste and bean meal at the rate of 2:1. The control pigs made an average daily gain of 0.69 lb. per head and required 3.8 lbs. of feed per pound of gain, while those on the experimental ration made an average daily gain of 0.77 lb. per head and consumed 3.4 lbs. of feed per unit of gain. In both experiments the pigs receiving the lactose paste required less feed per unit of gain. A short test of the tolerance of pigs for various amounts of paste indicated that not over 12 per cent would probably be the most satisfactory and economical.

Feeding of corn to foals [trans. title], A. KOSTOV (*Spis. Zeml. Izp. Inst. B''lgariia. (Rev. Insts. Recherches Agron. Bulgarie), 3 (1925), No. 4–6, pp. 419–*

428).—In a 121-day experiment during the winter, oats were compared with ground corn as the sole grain ration of colts ranging in initial weight from 172.5 to 258 kg. (380 to 568 lbs.). There were 9 animals in each lot, but 1 had to be removed from each lot because of illness. Those receiving a grain ration of 3 kg. of oats daily made an average daily gain of 0.363 kg. (0.8 lb.) per head, as compared with 0.208 kg., the average daily gain of those receiving 3 kg. of corn daily. Measurements of height at withers and rump, length of rump, depth and breadth of chest, heart girth, and circumference of the cannon bones were also recorded at the beginning and the end of the experiment. The more favorable results of the oat ration were considered due to the higher calcium and phosphorus content of the oats.

Heredity in the mule, A. PORCHEREL (*Internatl. Rev. Sci. and Pract. Agr. [Rome], n. ser., 3 (1925), No. 4, pp. 982–1003, pls. 5*).—This gives relative measurements of the different parts of the body of Poitou and Algerian asses and mules.

The relative postnatal growth of the systems and organs of the chicken, H. B. LATIMER (*Anat. Rec., 31 (1925), No. 3, pp. 233–253, figs. 10*).—This paper deals with a comparison of the relative increases of the different systems and organs and the growth of the entire body between hatching and maturity, based on the records of 100 Single Comb White Leghorns previously noted (E. S. R., 52, p. 772). The body weight increased 70.3 times but the nervous system increased only 6.6 times. Only 3 structures increased more rapidly than the gross body weight, the thyroid 113.6 times, the musculature 153.3, and the pancreas 214.0 times.

Tables and charts show the percentage weights of the different organs and parts in relation to different body weights from hatching to maturity. These data show different postnatal rates of growth for the different organs. In some the maximum relative size is at hatching, in others at maturity, and in others the maximum is attained between hatching and maturity, followed by a drop which at maturity may be relatively above or below the relation at hatching. A comparison of the life cycle in the chicken and in man indicates that the chicken matures relatively more rapidly than man, leaving a relatively longer period of mature life for the chicken.

Studies of the vitamin potency of cod liver oils.—XIX, Influence of cod liver oil on reproduction, A. D. HOLMES ET AL. (*Poultry Sci., 5 (1926), No. 3, pp. 110–116*).—In continuing this series of studies (E. S. R., 55, p. 386), the effect on the hatchability of the eggs resulting from giving hens 1 pint of cod-liver oil per 100 birds per week was determined. For the experiment 419 Rhode Island Red, 400 White Leghorn, and 336 Barred Rock hens were used. The hatching percentages were somewhat variable, but the authors conclude that the hatchability was materially increased by adding cod-liver oil to the ration of breeding hens.

The action of insulin on the domestic fowl, G. J. CASSIDY, S. DWORKIN, and W. H. FINNEY (*Amer. Jour. Physiol., 75 (1926), No. 3, pp. 609–615, figs. 4*).—In experiments at McGill University, the effect of insulin on the sugar content of the blood of fowls was studied. The normal blood sugar content of 11 fowls of the White Leghorn, Plymouth Rock, and Rhode Island Red breeds was found to vary between 161 and 260 mg., averaging 200 mg. per 100 cc. of blood. Fermentation tests indicated that the greater part of the reducing sugar present was glucose, but about 15 per cent of the reduction was due to substances not fermentable by yeast.

Doses of 4 units of insulin per kilogram of live weight caused an initial fall in the blood sugar lasting from 40 minutes to 1 hour followed by a secondary

fall, with recovery beginning in 3 to 6½ hours after the administration. The minimum blood sugar reached by such doses was 111 mg. per 100 cc. of blood. The administration of from 10 to 130 units of insulin per kilogram of live weight reduced the blood sugar to a minimum of 55 mg. per 100 cc. of blood. Similar results were obtained when 10 or 15 units of insulin were successively administered at intervals of 1 or 2 hours. In a bird starved for 12 days, 4 units of insulin reduced the blood sugar to 96 mg. Three other birds were starved for from 44 to 144 hours and given 5 or 6 injections of 10 to 15 units at hourly intervals. The minimum blood sugar obtained was 62 mg. per 100 cc. of blood. Starving the birds for 1 week and injecting them with large doses of insulin did not produce a significantly lower sugar content of blood than was produced in the other experiments.

When the blood sugar was reduced under 100 mg. per 100 cc. of blood, symptoms of hypoglycemia developed. In further experiments in which hypoglycemia was produced by the insulin, the fowls were immersed in tap water of approximately 20° C. (68° F.). Shivering was not observed until the blood sugar rose, indicating that hypoglycemia inhibits shivering in the fowl. Hypoglycemia also retarded the recovery of the normal temperature after the fowl's temperature had been lowered by immersion in cold water. The lowering of the body temperature also lowered the blood sugar content.

Studies on egg quality.—I, Introductory note on variations in yolk color, S. L. Parker, S. S. Gossman, and W. A. Lippincott (*Poultry Sci., 5 (1926), No. 3, pp. 131–145, figs. 2*).—This is a preliminary report of a study of the factors related to variations in the color of the yolks of hen's eggs, conducted at the California Experiment Station. The methods of grading the yolk color in the candled egg and after the egg is broken in a dish are described in detail.

The first study dealt with the effect of feeds on yolk color. Ten pens of birds were used for this purpose. The rations consisted of white or yellow corn with various supplements such as sprouted oats, green oats, or barley, alfalfa, kale, and lettuce in the different pens. The average results showed that the birds receiving white corn with no green feed produced eggs with very pale yolks, and that brighter colored yolks resulted when the birds received yellow corn, green feed, or both. Head lettuce and sprouted oats had little more effect than when no green feed was added.

As considerable consistent variation was observed in the color grades of the yolks of eggs laid by individuals in the same pen, tests of the relation of the color to the green feed consumption of individual birds were carried out, using 14 hens showing the most extreme differences. The results of this test indicated that the variations characteristic of individual birds were at least partially due to individual differences in the consumption of greens, although all had an equal opportunity. Variations from such a relation were, however, also observed in individual cases.

Ground grain versus whole grain for layers, D. C. Kennard and R. M. Bethke (*Poultry Sci., 5 (1926), No. 3, pp. 128–130*).—A more complete account is given of investigations previously noted from the Ohio Experiment Station (E. S. R., 53, p. 873). If one experiment, yearling White Leghorn hens fed in the usual way produced an average of 122 eggs per bird, while pens fed by the all-mash method produced an average of 119 eggs in 11 months. In tests with pullets, 2 lots fed by the all-mash method laid 150 and 159 eggs per bird in 11 months, as compared with 153 eggs, the average for pullets fed in the usual way.

Rate of maturity and first-year production in Leghorns, G. W. Hervey and M. Decker (*Poultry Sci., 5 (1926), No. 3, pp. 149–151, fig. 1*).—Data are pre-

sented from 378 March-hatched pullets, showing the relation between laying the first egg and the first year's egg production. A correlation of −0.2764±0.0320 between these characters indicated that early-maturing birds were the best producers.

Certain factors in relation to production and egg weight in White Leghorns, R. T. Parkhurst (*Poultry Sci., 5 (1926), No. 3, pp. 121–126*).—Data are given on 41 White Leghorn pullets hatched in 1923 and 70 pullets of similar breeding hatched in 1924 at the Idaho Experiment Station, which include the average number of days to first egg, winter and annual egg production, egg weight, and body weight, together with correlations between the different characters. From these data it is concluded that the early-maturing birds lay larger numbers of eggs during the winter and during the year than late-maturing birds. The early-maturing birds are also lighter in body weight when they start laying and the eggs are smaller. Egg weight was associated with the maximum body weight of the individual during the first laying year, but there was no significant correlation between the maximum body weight or egg weight and annual egg production.

Report of the fourth and fifth annual Canadian national egg-laying contests, F. C. Elford and A. G. Taylor (*Canada Dept. Agr. Bul. 56, n. ser. (1925), pp. 67, figs. 14*).—A report of the Canadian national egg-laying contest for the years 1922–23 and 1923–24.

The candling of eggs, W. A. Brown and W. H. Ault (*Canada Dept. Agr., Livestock Branch Circ. 41 (1926), pp. 4, figs. 7*).—Directions for candling eggs, with illustrations of the various defects likely to be found.

DAIRY FARMING—DAIRYING

The relative utilization of feed energy for maintenance, body increase, and milk production of cattle, E. B. Forbes, J. A. Fries, W. W. Braman, and M. Kriss (*Jour. Agr. Research [U. S.], 33 (1926), No. 5, pp. 483–492*).—Analyses of three respiration calorimeter experiments with dairy cows in different stages of lactation and on different planes of nutrition at the Pennsylvania Institute of Animal Nutrition showed that, after making corrections to the standard day for standing and lying, and comparing with the net energy utilized for body gains by each of the three cows when dry, the average net energy values of the feeds per kilogram of dry matter were 1,912 calories for maintenance, 1,451 calories for body increase, and 1,882 calories for milk production. It was thus calculated that the relative utilization of the net energy of the feed for these respective purposes was in the proportion of 1 : 0.761 : 0.985.

Lactose feed as a food for cows: A preliminary experiment, K. W. D. Campbell (*Jour. Min. Agr. [Gt. Brit.], 32 (1926), No. 10, pp. 918–920, pl. 1*).—The lactose feed produced at the whey research factory noted on page 769 was added at the rate of 1 lb. to a basal ration consisting of 1 lb. of decorticated cottonseed meal, 1 lb. of maize meal, and 1 lb. of bean meal. Two groups of 8 cows each were fed during two 14-day periods on each ration. The milk production did not appear to be significantly altered by the inclusion of the lactose feed.

Heredity and milking function, W. E. Agar (*Jour. Dept. Agr. Victoria, 24 (1926), No. 1, pp. 1–9*).—The results of a study of the comparative butterfat and milk production and butterfat percentage of 96 dams and daughters of Red Polls are reported. The production records were corrected to an average age of 6 years. These data showed correlations of 0.235±0.060 for butterfat

production, 0.093±0.071 for milk production, and 0.332±0.061 for fat percentage.

In studying the effect of the sire on production 73 of the daughters were found to have been sired by 14 bulls. Certain of the bulls tended to lower the production of their daughters as compared with their dams, while with others the production was increased in the majority of cases.

The effects of environment and heredity on butterfat and milk production are discussed.

Dairy laboratory outline, W. GRIMMER (*Milchwirtschaftliches Praktikum. Leipzig: Akad. Verlagsgesell., 1926, pp. VIII+295, figs. 70*).—This is a guide to the investigation of milk and dairy products, designed especially for the food chemist, dairyman, and farmer. It deals essentially with the methods of making physical, chemical, and biological analyses of milk, butter, cheese, and various materials used in the manufacture of dairy products.

The second portion of the book discusses the use of the findings in the different tests for the solution of practical problems.

Variations in the composition of milk, J. F. TOCHER (*Edinburgh: Govt., 1925, pp. 195, pls. 3, figs. 99*).—For the use of the Interdepartmental Committee on Milk of Scotland in classifying normal and diluted milk 320 samples of morning, 356 of evening, and 33 samples of noon milk were collected from individual cows from different parts of Scotland, and analyzed for butterfat, solids-not-fat, specific gravity, refractive index, and depression of the freezing point in the author's laboratory, and for lactose, ash, total nitrogen, casein nitrogen, and albumin nitrogen at the Rowett Research Institute. Of the samples of morning and evening milk 341 were from Ayrshire cows and 335 from other breeds. Nitrogen and specific gravity determinations were not made on a few of the samples. The analyses of the individual samples are tabulated, together with related information and the data from the morning and evening milk have been studied statistically. The following table gives the means and standard deviations for the milk from Ayrshire cows and from all breeds:

Means and standard deviations for the various characters studied

Character	Ayrshire cows		All cows	
	Means	Standard deviations	Means	Standard deviations
Percentage butterfat	4.085±0.029	0.7867±0.020	3.953±0.020	0.7810±0.014
Percentage solids-not-fat	8.753± .016	.4451± .011	8.804± .012	.4122± .008
Percentage lactose	4.568± .014	.3730± .010	4.635± .010	.3712± .007
Percentage ash	.691± .002	.0512± .001	.700± .001	.0505± .001
Percentage total nitrogen	.512± .002	.0659± .002	.508± .002	.0621± .001
Percentage total protein	3.267± .015	.4204± .011	3.241± .010	.3962± .007
Percentage casein nitrogen	.381± .002	.0543± .002	.380± .001	.0520± .001
Percentage albumin nitrogen	.118± .001	.0239± .001	.116± .001	.0232± .001
Freezing point (°C.)	.549± .001	.0244± .001	.548± .001	.0232± .000
Refractive index (scale readings)	38.102± .031	.8448± .022	38.275± .022	.8622± .016
Specific gravity at 15.5° C.	1,031.123± .056	1.5190± .040	1,031.528± .043	1.5636± .031
Yield (in pounds)	13.399± .171	4.6858± .121	13.919± .132	5.0851± .093
Weeks in milk	18.879± .477	13.0637± .337	19.481± .356	13.7219± .252
Age (in years)	6.150± .077	2.1216± .055	6.186± .054	2.0906± .038

The frequency distributions of each of the characters are tabulated and shown graphically with the curves of closest fit according to Pearson's types. The values of some of the frequency constants and related data follow:

Values of frequency constants and nature of curves fitted to distribution

Character	Unit	μ_2	β_1	β_2	κ_2	Mode	Skewness	Curve fitted	χ^2	P.
Age (in years)	1	4.370091	0.2163	3.1503	−0.4914	5.6382	0.2622	Type I	7.48	0.7577
Percentage butterfat	.25	9.759145	.8413	4.6993	+.8760	3.6646	.3737	Type IV	38.70	.0012
Percentage solids-not-fat	.25	3.128256	.1366	4.1590	+.0565	8.7511	.1205	Type IV	10.29	.5908
Percentage ash	.02	6.383324	.1486	4.0534	+.0706	.6938	.1310	Type IV	13.36	.4214
Percentage lactose	.20	3.444403	1.0417	4.9920	+1.1498	4.7905	−.4200	Type V	5.39	.9087
Percentage total nitrogen	.025	6.179973	.9545	5.3698	+.4786	.4866	.3373	Type IV	5.63	.9569
Percentage casein nitrogen	.025	4.327308	.7549	5.0076	+.3891	.3642	.3023	Type IV	6.12	.8647
Percentage albuminoid nitrogen	.01	5.392108	.7098	3.8446	−1.4025	.1052	.4833	Type I	5.31	.9662
Freezing point (°C.)	.01	2.426592	1.1730	4.8448	+6.6739	.5357	.5190	Type III	26.20	.0019
Refractive index	[1].25	11.893234	.1162	2.9485	−.1989	38.4483	−.2009	Type I	21.36	.2113
Specific gravity	.50	9.779422	.0182	3.1268	+.0691	1,031.6292	−.0644	Normal	8.59	.8550

[1] Refractometer scale.

The variation observed and its significance is discussed, including extreme cases. The correlation coefficients, correlation ratios, and regression equations are presented in tabular form and graphically for each pair of constituents and other characters of the milk samples.

It was shown that the regressions of ash, lactose, refractive index, freezing point, solids-not-fat, total nitrogen, and specific gravity on age were linear. Other linear regressions were those of butterfat, casein nitrogen, and solids-not-fat on lactose; ash on freezing point; ash, total nitrogen, and butterfat on refractive index; solids-not-fat on specific gravity; solids-not-fat on butterfat; butterfat on solids-not-fat; and lactose and albumin nitrogen on weeks of the lactation period.

The regressions found to be parabolic were butterfat, casein nitrogen, and albumin nitrogen on age; yield, ash, total nitrogen, and albumin nitrogen on lactose; total nitrogen, casein nitrogen, albumin nitrogen, and solids-not-fat on ash; lactose, solids-not-fat, butterfat, albumin nitrogen, casein nitrogen, and lactose and ash on freezing point; freezing point, lactose, lactose and ash, and solids-not-fat on refractive index; butterfat and lactose on specific gravity; total nitrogen, lactose, and casein nitrogen on solids-not-fat; butterfat and solids-not-fat on weeks of the lactation period; and albumen nitrogen, casein nitrogen, butterfat, solids-not-fat, ash, and lactose on yield.

The cubical regressions were yield on age, and yield on weeks of the lactation period.

One of the most unexpected correlations observed was that of a positive relation between the milk yield and the lactose percentage in the milk. Other higher correlations were found, but the characters were of more obvious interdependence.

The relations of the various individual characters are discussed in detail, with special reference to the formulation of standards for determining adulteration. The water content was also given special consideration from this standpoint.

In general this study has shown that there is wide variation in the composition of normal milk from individual cows. The author suggests that the best

means by which the public may obtain a uniform supply is to secure mixed milk from large numbers of cows.

The absorption of gas, odors, and flavors in milk [trans. title], E. ALT (*Landw. Jahrb. Bayern, 16 (1926), No. 1-3, pp. 10-30*).—The relation of temperature and fat content of milk to its ability to absorb gas was tested by passing over the milk air which had previously been passed through the urine of cattle. The difference in the nitrogen content of 10 cc. of the milk before and after the treatment was used as the index of absorption. Preliminary tests showed that there was practically no difference in the amount of absorbed nitrogen when the time of exposure averaged from 20 to 40 minutes, and therefore 30 minutes was adopted as the usual testing period.

The effect of increasing the temperature was determined in one experiment. The milk was exposed to air passed through urine and heated from 17° C., when it contained 42.70 mg. of nitrogen per 10 cc., through various temperatures to 52°. Irregular increases in the nitrogen content were recorded up to 50°, when the milk contained 79.75 mg. of nitrogen in 10 cc., but there was no further increase accompanying an additional rise in the temperature. The largest increase in nitrogen for a single degree of rise in temperature was between 34 and 35°, when an increase of 13.60 mg. of nitrogen was recorded. In another experiment the milk was heated to 80°, and it was again found that the maximum nitrogen content was reached at 50° and that the nitrogen content decreased above 60°. In further experiments in which the milk was cooled from 40 to 10° during a period of 2½ hours with exposure to the urine-contaminated air, the nitrogen content of the milk decreased from 60.3 mg. of nitrogen per 10 cc. to 48.3 mg. of nitrogen. In an equivalent amount of milk no reduction occurred between 15 and 10°. Less nitrogen was given off by milk rapidly cooled from 33.9 to 5° in 20 minutes.

In studying the effect of the fat content on the absorption of gas, water at different temperatures was found to absorb practically the same amount of nitrogen from the urine-contaminated air, but the absorption increased with increases in temperature when 1.34 per cent of butterfat was added to the water as an emulsion. Similar experiments were conducted with milk varying in fat content. In skim milk with 0.12 per cent of fat there was no increase in the nitrogen absorption associated with increased temperature, but whole milk containing 3.65 per cent of fat increased in its nitrogen content over 3 mg. per 10 cc. of milk after exposure to the urine-contaminated air at 15°, over 4 mg. at 20° and over 6 mg. at 35°. Further increases with temperature were found to occur with milk containing 5.7 per cent of fat and with butter containing approximately 82 per cent of butterfat. It is concluded that the fat of milk is largely responsible for the qualities which make dairy products so susceptible to the absorption of foreign flavors and odors.

Observations on "pin point colony" organisms in the Baltimore milk supply, J. C. SWENARTON (*Jour. Bact., 11 (1926), No. 4, pp. 285-292, fig. 1*).—In connection with the routine milk control work of the Baltimore City Health Department it was observed that "pin point colonies" were more prevalent in raw and pasteurized milk during the months of January, February, March, and April, which correspond to the spring freshening period and the time when udder troubles are prevalent. Special studies of the cultural characteristics and morphology were carried on with 16 of 52 such colonies isolated from raw milk, pasteurized milk, and ice cream. Fifty of these cultures proved to be streptococci, and the other two when replated produced large colonies, indicating that pin point colonies are due to streptococci. The cultural characteristics of the 16 streptococci are tabulated. There appeared to be several

types in this group, but those from raw milk differed from those isolated from pasteurized milk or ice cream. Those from raw milk resembled *Streptococcus acidominimus*, which is associated with minor udder troubles.

VETERINARY MEDICINE

Veterinary toxicology, G. D. LANDER (*London: Baillière, Tindall & Cox, 1926, 2. ed., pp. XIV+325, figs. 39*).—This is a revised edition of the work published in 1912, previously noted (E. S. R., 28, p. 880).

[Reports of the Civil Veterinary Department, Assam, 1924–25 and 1925–26], W. HARRIS (*Assam Civ. Vet. Dept. Rpts., 1924–25, pp. [1]+17; 1925–26, pp. [1]+17*).—The usual annual reports (E. S. R., 54, p. 475) upon the occurrence of infectious diseases of livestock and control measures.

Studies on botulinum toxin in the alimentary tract of hogs, rabbits, guinea pigs, and mice, G. M. DACK and J. GIBBARD (*Jour. Infect. Diseases, 39 (1926), No. 3, pp. 173–180*).—In the authors' experiments there was no evidence that type A botulinum toxin was adsorbed by the intestinal contents in vitro even where the pH was shifted with N/3,000 hydrochloric acid or sodium phosphate. Hogs were found to be very resistant to large oral doses of toxin. In some cases as much as 10,000,000 m. l. ds. for mice were fed without producing any ill effects. Toxin was not demonstrated in 1 cc. of blood taken from a hog which had been fed 9,000,000 (mouse) m. l. ds.

Rabies in man and animals, R. KRAUS, F. GERLACH, and E. SCHWEINBURG (*Lyssa bei Mensch und Tier. Berlin: Urban & Schwarzenberg, 1926, pp. VIII+464, pls. 6, figs. 69*).—This is a monographic account.

Some phases of avian tuberculosis and their bearing on the tuberculosis problem, L. VAN ES (*Cornell Vet., 16 (1926), No. 2, pp. 94–106*).—These data have been noted from another source (E. S. R., 53, p. 384).

Tularemia, with report of fatal case simulating cholangeitis, with postmortem report, J. R. VERBRYCKE, JR. (*Jour. Amer. Med. Assoc., 82 (1924), No. 20, pp. 1577–1581, figs. 7*).—Reporting upon a fatal case of the disease due to *Bacterium tularense*, which was contracted in Washington, D. C., while dressing rabbits purchased at the city market (E. S. R., 49, p. 784), the author takes occasion to present a general summary of information on the disease.

Bovine coccidiosis, R. GWATKIN (*Ontario Vet. Col. Rpt. 1925, pp. 68–70*).—The author diagnosed coccidiosis in four herds on farms within a few miles of each other. There were no fatal cases, and recovery in most cases was fairly rapid.

The piroplasmoses of cattle in India, H. COOPER (*Agr. Jour. India, 21 (1926), No. 4, pp. 313–317, pl. 1*).—This is a preliminary note.

Specific identity of whipworms from swine, B. SCHWARTZ (*Jour. Agr. Research [U. S.], 33 (1926), No. 4, pp. 311–316, figs. 2*).—A comparison of whipworms (Trichuris) from man, the chimpanzee, Cercopithecus, and swine has shown that the worms from these hosts are morphologically indistinguishable, as far as they have been compared. The differentiation between whipworms from man and other primates and those occurring in swine made by A. Schneider[a] has been shown to be due to individual variation, since the characters regarded by Schneider as specific for whipworms from primates are present in whipworms from swine, and vice versa. Thus *T. suis* and its synonyms *T. crenatus* and *T. apri* must for the present be regarded as synonyms of *T. trichiura*. Since the probability that the human and swine whipworms are identical implies the possible necessity for taking cognizance of swine as sources

[a] Monographie der Nematoden. Berlin: Georg Reimer, 1866, pp. VIII+357.

of infestation for man, it is important that the possible transmission of Trichuris from man to swine and from swine to man, or at least to other primates, be investigated experimentally, and such experiments are contemplated.

On the cestode genus Dipylidium from cats and dogs, T. M. MILLZNER (*Calif. Univ. Pubs., Zool., 28 (1926), No. 17, pp. 317–356, pls. 7*).—This discussion includes descriptions of seven species of Dipylidium taken from dogs or cats, or both, in California, five of which are new, and a descriptive table of all the known Dipylidium.

Experiments on the transmission of rabbit coccidia to chicks [trans. title], E. UHLHORN (*Arch. Protistenk., 55 (1926), No. 1, pp. 101–167*).—The first part of this paper reviews the literature on Eimeria pathogenic for the rabbit and fowl (pp. 103–122). This is followed by an account of the author's experiments, in which it was fonnd possible to transmit coccidia from the rabbit to chicks. Variation was found to occur in coccidia in the rabbit, and it was not always possible to distinguish between *E. stiedae* Lind. and *E. perforans* Leuc., nor to differentiate their pathogenic action. The development of the rabbit coccidia was found to be retarded in the chick host. A list of 46 references to the literature is included. Accounts of the coccidia of rabbits by Lucet (E. S. R., 32, p. 180) and Pérard (E. S. R., 53, p. 280; 54, p. 479) have been noted.

Some notes on avian diphtheria (chicken-pox), R. GWATKIN (*Ontario Vet. Col. Rpt. 1924, pp. 54–61, fig. 1*).—This is a report of an acute infection of the respiratory organs of fowls, with formation of bloody exudate and blood clots in the trachea, that is sometimes seen at, or after, poultry shows, and which was found to be avian diphtheria.

"The filterability of the causative agent was confirmed and also that the various forms of avian diphtheria and chicken pox can be produced by the same virus. Bacteria isolated from lesions of avian diphtheria failed to produce lesions when scarified into susceptible birds. The spinal cord of an affected bird, in the one case tried, did not contain the virus. Vaccinia virus did not produce lesions when scarified into the combs of birds afterwards shown to be susceptible to chicken-pox virus. Vaccination was of value in controlling outbreaks of avian diphtheria and lowering the mortality in the mucous membrane form of the disease. Vaccination as a precautionary measure in healthy flocks was not of value, as already reported by Beach and others, and in one case was followed by bad results. Vaccination with the ordinary dosage was not of value in the treatment of bad cases. Five out of six very bad cases appeared to respond to larger and repeated doses of vaccine, but this experiment was not controlled. On the basis of results obtained, work will be continued with the vaccine in the control of outbreaks and in treatment of affected birds with heavy dosage."

Further notes on avian diphtheria (chicken-pox), R. GWATKIN (*Ontario Vet. Col. Rpt. 1925, pp. 64–68, fig. 1*).—In experiments conducted during the year tests of the blood of cockerels whose combs were artificially infected with chicken-pox virus showed that in the birds examined the virus was not present before the removal of scabs, but did occur in the blood of birds that died or were ill after their removal, indicating that a generalization of the virus might be the cause of illness and death that commonly follows the collection of scabs.

Bacillary white diarrhoea of chicks, H. R. SEDDON and H. R. CARNE (*N. S. Wales Dept. Agr., Sci. Bul. 26 (1926), pp. 20–24*).—The authors report upon three outbreaks of this disease which came to their attention during the year

1924–25. It is pointed out that the only previous record of its occurrence in Australia is that of Seddon, who recognized its presence in Victoria and studied the cultural characters of the strain he isolated, as reported in a paper read before the meeting of the Australian Association for the Advancement of Science at Melbourne, in 1921.

A newly recognized fluke disease (prosthogonimiasis) of fowls in the United States, A. Kotlan and W. L. Chandler (*Jour. Amer. Vet. Med. Assoc., 67 (1925), No. 6, pp. 756–763, figs. 2*).—This is a report of studies in Michigan of a fluke disease of fowls due to a new species of Prosthogonimus resembling *P. intercalandus* Szi., first discovered by Hieronymi and Szidat in 1921 in the oviduct of fowls.[8] They recorded serious losses due to this affection, especially in certain parts of Germany. These flukes were found by Chandler in 1921 in the oviduct of a wing-pinioned mallard duck from Duck Lake, in the vicinity of Muskegon, Mich. The authors report upon the findings in 1 of some 25 chickens on the same ranch, which succumbed with the same symptoms, and give a description of the fluke.

Neuritis in chickens, L. P. Doyle (*Jour. Amer. Vet. Med. Assoc., 68 (1926), No. 5, pp. 622–630, figs. 8*).—This is a contribution from the Indiana Experiment Station on neuritis in chickens, which has been prevalent during the past few years. It is said to be similar to, if not identical with, a disease of chickens occurring in Holland and due, apparently, to a filtrable virus, as reported by Van der Walle and Winkler-Junius (E. S. R., 50, p. 685). In the author's studies, injection and feeding experiments gave negative results during the periods of observation, which ranged from a few days to eight months in length.

A parasitic disease of the esophagus of turkeys, E. B. Cram (*North Amer. Vet., 7 (1926), No. 10, pp. 46–48, figs. 2*).—The author reports that a number of turkeys originating in Maryland were found to harbor the parasitic nematode *Capillaria annulata*, the walls of the esophagus, including the crop, being more or less seriously affected, depending upon the degree of infestation. This appears to be the first report of the occurrence of this parasite in the United States, and the first record of parasitism of the turkey. Records of its occurrence indicate that the chicken and pheasant are the hosts most frequently parasitized, having been found infesting these birds in Europe, Brazil, and the Philippine Islands. In chickens the only symptom is an occasional stretching of the neck, there being no apparent pathological condition, the birds remaining in good flesh and showing no gross pathology on post-mortem examination. In pheasants, however, death has in many cases been attributed to this parasite, there being marked evidence of malnutrition, emaciation, and a severe anemia. The eggs of the parasite do not appear to be resistant to drying, so that the raising of turkeys on dry ground is indicated as a prophylactic measure.

Pathological lesions caused by Capillaria annulata, S. L. Hung (*North Amer. Vet., 7 (1926), No. 10, pp. 49, 50, figs. 2*).—This is a report of studies of the diseased tissues found in infested turkeys, reported upon in the paper above noted.

AGRICULTURAL ENGINEERING

First progress report on soil erosion experiments, North Carolina Experiment Station Farm, West Raleigh, Wake County, North Carolina, F. O. Bartel (*U. S. Dept. Agr., Bur. Pub. Roads, Div. Agr. Engin., 1925, pp.*

[8] Centbl. Bakt. [etc.], 1. Abt., Orig., 86 (1921), No. 3, pp. 236–241.

[2]+21, *pls. 5*).—Experiments conducted by the North Carolina Experiment Station in cooperation with the U. S. D. A. Bureau of Public Roads to determine the amount of run-off and soil eroded from plats of Cecil fine sandy loam soil of varying lengths and also from plats of equal length when growing different crops are reported. The installation consisted of seven plats each 6 ft. in width and ranging from 37.5 to 200 ft. in length. The slope averaged about 9 per cent and was quite uniform. At the foot of the plats are a series of tanks set in the ground with their tops approximately level with the surface at their upper sides. Each plat is inclosed by a tight fence set well into the ground, and the run-off from each plat is confined and caught in the corresponding tank. The crops planted on the different plats were cotton, grass, and corn, and in some cases the plats were cultivated but not planted.

The results indicated that run-off is apparently proportional to the intensity and the amount of rainfall rather than to amount alone. The average run-off was found to be 35 per cent of the rainfall, and the maximum for a single rain 64 per cent. Erosion seemed to follow the same principle to some extent, although the controlling factor in this case appeared to be cultivation. During June, July, and August, when this was being practiced, the average percentage of run-off and erosion was 0.99. During the remainder of the year it was only 0.12 per cent.

The character of the vegetative covering of the soil was found to be the principal factor in controlling erosion. During June, when cultivation was carried on and before the crops had made material growth, 50 per cent of the annual erosion occurred. The rainfall during this month was 15 per cent of the total and the run-off 25 per cent.

Grass sod was found to be strikingly efficient in decreasing both run-off and erosion. Omitting the June record, the run-off from the grass plat was 27.5 per cent and the erosion 2.7 per cent as compared with the bare plat. Corn also showed a beneficial effect in both instances, while erosion was increased on cotton. The total run-off from cotton also showed an increase over that from the bare plat, although if the June record is omitted a decrease is shown.

The amount of run-off was found to decrease with an increase in the length of the plat. Erosion was irregular in this respect.

Waste through soil erosion, M. F. MILLER (*Jour. Amer. Soc. Agron., 18 (1926), No. 2, pp. 153–160*).—In a contribution from the Missouri Experiment Station the results of soil erosion studies are briefly summarized, the progress of which has been noted from time to time in the *Record*. The available data are said to be fairly conclusive in showing that on lands of moderate slope a proper crop rotation will reduce the rate of soil removal to a negligible point.

Subsoiling machinery and the requirements of deep plowing [trans. title], L. ENGELBRECHT (*Landw. Jahrb., 62 (1925), No. 6, pp. 879–945, figs. 43*).—The first part of this report traces the history of deep tillage in Germany, and draws special attention to the corresponding development of deep tillage machinery. The second part comprises an analysis of the engineering mechanics involved in the development of the necessary machinery on the basis of the requirements of deep tillage.

Tests of deep tillage tools showed the superiority of the goose-foot share over the right angled triangle and chisel shapes. The chisel shape was valuable for some purposes, but the triangular share was rejected on account of its excessive draft.

A bibliography is appended.

Use of water in irrigation, S. FORTIER (*New York and London: McGraw-Hill Book Co., 1926, 3. ed., pp. XIII+420, pls. 6, figs. 112*).—This is the third edition of this book (E. S. R., 37, p. 185).

Seasonal variation in salinity of water of some drains of the first circle of irrigation, R. ALADJEM (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 66 (1926), pp. [1]+4, pls. 5*).—The results of chemical analyses of drainage waters from irrigated soils are graphically presented, indicating the seasonal variations.

The variations depend on the amount of water available in summer and consequently on the state of the river. The maximum salinity occurs in January during the time of clearance of the canals and when little or no water is available for irrigation. The drainage waters become more and more saline until water is again available. After February the salinity increases until July, when the true natural maximum occurs. The actual maximum occurring in January is regarded as artificial. After July as the flood water arrives the amount of water available becomes greater, and the salinity of the drainage water is reduced to a minimum. The low salinity generally continues until the time of winter clearance.

It is noted that the curve for sodium chloride is almost parallel to that for total dissolved solids and forms from 40 to 90 per cent, the remainder being bicarbonates and bisulfates.

The conclusion is drawn that there can be little chance of using drainage water for the irrigation of crops when the Nile is low. However, it is thought that the waters of some drains may be usefully employed for the preliminary washing of salt land during the process of reclamation.

Blasters' handbook, A. LA MOTTE (*Wilmington: E. I. du Pont de Nemours & Co., 1925, pp. 198, figs. 200*).—This handbook describes practical methods of using explosives for various blasting purposes, including, among other things, the clearing of land of stumps and rocks, removing log jams, and various types of construction.

Permeability of stone, D. W. KESSLER (*U. S. Dept. Com., Bur. Standards Technol. Paper 305 (1926), pp. 155-172, pls. 2, figs. 3*).—This paper describes an apparatus for measuring the permeability of stones and concretes, and presents the results of a limited number of tests of six types of natural stone to determine the adaptability of the apparatus to a considerable range in textures. Experiments on the value of a penetrating waterproofing material on marble indicated that the permeability of this material can be reduced 98 per cent by this means. The tests in general indicated that the relation of permeability to the pressure is approximately a straight-line ratio. A comparison of the permeability of specimens of different thicknesses indicated that by doubling the thickness the permeability was reduced approximately one-third.

Differentiation of the action of acids, alkali waters, and frost on normal Portland cement concrete, C. J. MACKENZIE and T. T. THORVALDSON (*Engin. Jour. [Canada], 9 (1926), No. 2, pp. 79-84, figs. 3*).—In a contribution from the University of Saskatchewan a description is given of an actual case where concrete disintegration caused by alkali water, acid water, and frost occurred in one structure in which conditions were such that failure could have been attributed to any one of the three causes. The chemical methods developed and adopted to determine definitely the cause of disintegration in each case are presented.

Effect of size and shape of test specimen on compressive strength of concrete, H. F. GONNERMAN (*Amer. Soc. Testing Materials Proc., 25 (1925), pt. 2, pp. 237-250, figs. 4; also Lewis Inst., Struct. Materials Research Lab. Bul. 16 (1925), pp. 16, figs. 4*).—In studies conducted at the Lewis Institute with 1,755

test specimens, the 6 by 12 in. cylinder generally used for compression tests of concrete was found to be a satisfactory form of specimen. However, because of the likelihood of nonuniform placing, it is recommended that the use of this size of cylinder be limited to aggregates 2 in. or less in diameter.

The 4 by 8 in. or 5 by 10 in. cylinders were found suitable for the smaller sizes of aggregate. It is concluded that the ratio of diameter of cylinder to maximum size of aggregate should not be less than about 3, and that for aggregates larger than 2 in., 8 by 16 in. cylinders or larger should be used.

Lower strengths were usually obtained with the larger cylinders of a length equal to 2 diameters. The decrease in strength with size of cylinder was not important for diameters of 6 in. or less. The 6 and 8 in. cubes tested at ages of from 7 days to 1 year gave strengths averaging, respectively, 18 and 13 per cent higher than those given by 6 by 12 in. cylinders. The compressive strength increased with age for all forms of moist cured specimens.

Studies of bond between concrete and steel, D. A. Abrams (*Amer. Soc. Testing Materials Proc., 25 (1925), pt. 2, pp. 256–272, figs. 11*).—Studies conducted at the Lewis Institute are reported which showed that the slipping of a steel bar imbedded in concrete begins at a bond stress of from 10 to 15 per cent of the compressive strength of the concrete, but that considerable additional load is taken before the ultimate bond resistance is reached.

Bond and compressive strengths were found to increase with the age of the concrete from 7 days to 1 year. The bond strength responded to changes in the water ratio of the concrete in much the same way as the compressive strength. An increase in the water ratio due to the use of wetter concrete, less cement, or an excess of fine aggregate resulted in material reductions in both bond and compressive strengths. The bond strength decreased for mixtures richer than 1:1.

It is concluded that the use of 4 per cent of the 28-day compressive strength of concrete as the working stress in bond for plain bars is justified, and that this gives a factor of safety of from 2.5 to 3 against first slip.

The use of crude oil to replace mixing water in general caused a reduction in both bond and compressive strengths. Replacing cement with hydrated lime decreased the compressive and bond strengths about 1.2 per cent for each 1 per cent of hydrated lime in terms of volume of cement.

Machine for the determination of the pliability of prepared roofing and the breaking point of bitumen, C. S. Reeve and F. W. Yeager (*Amer. Soc. Testing Materials Proc., 25 (1925), pt. 2, pp. 385–389, fig. 1*).—A machine is described which operates on the principle that when a piece of roofing is bent at a given temperature over a $\frac{1}{16}$-in. mandril until cracks appear in the coating, the angle through which the piece is bent is a measure of the pliability of the product at that temperature. Results are presented to show the range of reproducibility for the same and different operators. The use of the apparatus for the determination of the breaking point of bitumen is also developed.

Public Roads, [September, 1926] (*U. S. Dept. Agr., Public Roads, 7 (1926), No. 7, pp. 129–152+[2], figs. 31*).—This number of this periodical contains the status of Federal-aid highway construction as of August 31, 1926, together with the following articles: Thin Brick Pavements Studied, by L. W. Teller and J. T. Pauls; An Instrument for the Measurement of Relative Road Roughness; The Flow of Water through Culverts; Motor Vehicle Registrations for the First Six Months of 1926; and Receipts from Motor Vehicle Fees, etc., for the First Six Months of 1926.

Handbook of steam engineering, W. E. Biggs and W. R. Woolrich (*Knoxville: Engin. Press, 1925, pp. [4]+389, figs. 101*).—This is a handbook of prac-

tical information on the subject, which deals primarily with power plant operation, construction, and maintenance.

Progress in the measurement of motor fuel volatility, T. S. SLIGH, JR. (*Jour. Soc. Automotive Engin., 18 (1926), No. 4, pp. 393–396, figs. 3*).—In a contribution from the U. S. Bureau of Standards laboratory test methods of indicating the volatility characteristics and the starting capability of fuels used in internal combustion engines are described, together with the testing apparatus and procedure.

A year's progress with South Dakota's farm electric test line, R. L. PATTY (*S. Dak. Agr. Col. Ext. Circ. 232 (1925), pp. 19, figs. 12*).—The results of a year's work with a low voltage electric power line in the community around Renner, S. Dak., are briefly summarized. The line is a 2,300 volt, single phase, ungrounded, No. 6 copper wire line, built especially for farm service, and is 8.4 miles long exclusive of the stub lines into the buildings. Each farm has a separate transformer. There are 17 farms on the line, averaging 2 farms to the mile. The type of farming on this line is largely dairy, there being an average of 18 milk cows per farm. The work thus far has dealt with water pumping, grinding feed and shelling corn, machine milking, separating cream, operating home pressure water systems, cleaning grain, operating a line shaft for belt-driven machinery, sawing wood, refrigeration, operating household equipment, heating water for stock, and lighting poultry houses.

The results so far indicate that while 3 kw. transformers may prove large enough for the average farm, they will not be large enough for all of the farms. It has been found to pay to use as small a motor as possible for such work as feed grinding, as better service may be had at a lower rate if a small motor is run 3 or 4 hours than a large motor 1 hour. The load is thus spread out more uniformly throughout the day and the peak load does not go so high. It has been found that the peak load on this farm line always comes in the evening at chore time. This is considered to be a characteristic of a farm line in a dairy community, owing largely to the operation of the milking machines. It is also thought that electric ranges will make this condition worse because they will also be in use at chore time, causing the peak load to go still higher.

Cost data on the performance of specific operations by electricity are presented and briefly discussed.

Machining tractor cylinder sleeves (*Machinery, 32 (1926), No. 8, pp. 628–631, figs. 11*).—The operations performed in finishing cylinder sleeves for tractor engines are outlined and illustrated.

Construction of heavy concrete rollers [trans. title], H. ÅKERBERG (*Svenska Mosskulturför. Tidskr., 39 (1925), No. 5–6, pp. 338–351, figs. 9*).—Information on the construction and use of different kinds of concrete rollers and on their action on the soil is presented. Detailed drawings of different types and of the forms for use in their construction are included.

Plow moldboards [trans. title], M. RINGELMANN (*Compt. Rend. Acad. Agr. France, 11 (1925), No. 27, pp. 737–743*).—Experiments on the draft of three plows, one having a cylindrical moldboard, one a helicoidal moldboard, and one a nearly flat moldboard with a nearly horizontal point are briefly reported. The plow with the cylindrical moldboard had the lightest draft. The drafts of the plows with the helicoidal and flat moldboards were 26 and 60 per cent greater, respectively. There was such a sharp angle between the flat moldboard and the horizontal point that compacted soil lodged in the angle during operation, forming a new moldboard surface with a consequently very high coefficient of friction. The conclusion is drawn that shape of the moldboard

rather than the composition of the metal surface is the governing factor in the draft of moldboard plows.

The fire resistance of gypsum partitions, S. H. INGBERG (*Amer. Soc. Testing Materials Proc., 25 (1925), pt. 2, pp. 299–314*).—Tests conducted at the U. S. Bureau of Standards are reported which showed that gypsum block construction of proper material and thickness gave performance indicating good ability to stop or retard fires in buildings when used in nonbearing partitions not subject to heavy impacts. The temperatures transmitted to the unexposed side were in no case excessive, and there was no pronounced bulging or cracking of the partition. The gypsum on the fire side dehydrated and became weak and crumbly. Plaster that remained in place during the fire exposure was found to add considerably to the resistance of the partition, and indicated the desirability of the present practice of scoring the surface of the blocks to give a key for the plaster.

Development and present status of community agricultural warehouses in Bavaria [trans. title], E. HOHENEGG (*Landw. Jahrb. Bayern, 15 (1925), No. 5–6, pp. 167–232, pl. 1, figs. 12*).—A large amount of information on the development and use of agricultural warehouses in Bavaria is presented.

Regulation of drainage apparatus called septic tanks [trans. title], A. CALMETTE and E. ROLANTS (*Rev. Hyg., 47 (1925), No. 6, pp. 481–489; abs. in Chem. Abs., 19 (1925), No. 20, p. 3136*).—Proposed regulations for septic tanks for isolated residences and unsewered parts of cities in France are briefly set forth. The regulations require a trickling filter or bacterial bed to follow tank treatment. The size of the tank must provide a minimum of 250 liters (66 gal.) per person where water closets only are connected and 500 liters per person where kitchen wastes are added. Bath water, roof run-off, etc., are to be excluded. The trickling filter must have a minimum depth of 1 meter (3.28 ft.) and an area of 1 square meter for every 10 people with a minimum total area of 0.5 square meter. If the effluent contains more than enough organic matter to produce 200 parts per million of ammonia it must be diluted. The effluent must not contain more than 30 parts per million of suspended organic matter, and a stoppered 150-cc. sample kept 7 days at 30° C. (86° F.) must not show evidence of putrefaction.

RURAL ECONOMICS AND SOCIOLOGY

Rent and interest as shares in the product of enterprise, W. I. KING (*Jour. Land and Pub. Utility Econ., 2 (1926), No. 2, pp. 208–216*).—Money had or borrowed by an entrepreneur is invested in land, power, wages, and salaries, and, therefore, it is as logical to connect interest with the supply of land or of labor as with that of intermediate or capital goods. Rents are not dependent upon the value of the object rendering the service, the value being the present worth of all the service rewards or rents expected in the future. Interest payments, on the other hand, presuppose an agreement as to value and are a percentage of the face of the loan.

The income of a group of people may be divided either into wages, salaries, contract rent, interest on money loaned, and individual profits withdrawn, or as logically, partly on the basis of imputation, into (1) rewards for services of human beings; (2) rewards paid for the services of natural resources and improvements inextricably entangled with them (the economic rent of orthodox economists); (3) rewards for services of all intermediate or transition goods, which reward is practically identical with the rent paid for services of land or other natural resources and involves no assumption as to the value of these

goods; and (4) the residuum, commonly called profits, made up of imputed wages for entrepreneurs, of payments for risks carried, monopoly gains, and fortuitous gains or losses.

Whether rent, as used by the author to cover all rewards of services of physical objects or interest, is to be imputed in any instance depends upon the question to be answered. The discussed differences between imputed rent and imputed interest are illustratd by six problems in arriving at the cost of production and labor income of a farmer.

The Fairway Farms project, M. L. Wilson (*Jour. Land and Pub. Utility Econ., 2 (1926), No. 2, pp. 156–171, fig. 1*).—The Fairway Farms Corporation of Montana, a nonstock, nonprofit corporation, was organized in 1924 to carry out the first of a series of experiments to find and demonstrate better practices in adjusting the relations of farmers to the land. Eight farm units have been created, five of which, ranging from 130 to 3,040 acres in size, were in operation in 1925. The organization and financing of the corporation, the farms selected, terms under which farms were acquired, methods of securing tenant-purchasers, the organization and practice adopted for each farm, the equipment furnished the tenant-purchasers, and some of the results of the first year are described.

Some of the provisions of the tenant-purchaser contract are (1) no specific payments are due at specific times. All returns of each farm are paid into a gross income fund held by the corporation, from which taxes, insurance, interest, operating expenses, and advances for equipment, stock, and living expenses of the tenant are to be paid. When the balance in this fund equals 25 per cent of the purchase price the tenant may apply it on the purchase price and obtain a sale contract. (2) The corporation and the tenant-purchaser agree upon a plan of organization and operation of the farm. The department of farm management of the Montana State College of Agriculture assists in formulating this farm plan. (3) The contract is cancelled by the death or permanent disability of the tenant-purchaser, all the net profits being turned over to him or his heirs. It is automatically cancelled at the end of five years if the net profit does not amount to 25 per cent of the purchase price, any net profit being divided equally between the corporation and the tenant-purchaser. The corporation may cancel the contract if the tenant-purchaser proves dishonest or incompetent.

Relation of the fruit and vegetable industry to other farm enterprises, L. C. Corbett, W. R. Beattie, and H. R. Tolley (*U. S. Dept. Agr. Yearbook 1925, pp. 125–131*).—Some of the chief factors to be considered in combining fruit and vegetable growing with other types of farming are discussed.

Horticultural outlook, L. C. Corbett and W. R. Beattie (*U. S. Dept. Agr. Yearbook 1925, pp. 719–727*).—A brief review of some of the factors having an important bearing on the spread and development of horticultural production.

Evolution of cotton marketing, A. B. Cox (*U. S. Dept. Agr., Bur. Agr. Econ., Spec. Rpt., 1925, pp. [2]+21; also in Internatl. Cotton Bul., 4 (1926), No. 16, pp. 522–535*).—This article, issued in mimeographed form, gives a history of the cotton industry and the marketing of cotton, together with a description of some of the present-day developments and complications that may fundamentally affect cotton marketing methods.

The Canadian wheat pool year book, 1925 (*Winnipeg: Canad. Coop. Wheat Producers, [1926], pp. 108, figs. 11*).—The efforts to develop a cooperative wheat-marketing system following the discontinuance of the Canada Wheat Board and the organization and operation of three wheat pool associations, in Alberta, Saskatchewan, and Manitoba, and of a central selling agency,

Canadian Cooperative Wheat Producers, Limited, are described. Appendixes include the wheat pool contracts of each association and the coarse grains pool contracts of the Saskatchewan and Manitoba associations with their members, the agreements of each association with the elevator companies, the agreement of the Manitoba growers and the Manitoba pool elevator association, the agreement of the wheat pool associations with the central selling agency, and the financial statements of the three associations for the year ended July or August, 1925.

Marketing fruits and vegetables, A. W. McKay, H. W. Samson, R. R. Pailthrop, L. B. Flohr, L. C. Corbett, L. A. Hawkins, J. R. Magness, H. P. Gould, and W. R. Beattie (*U. S. Dept. Agr. Yearbook 1925, pp. 623–710, figs. 39*).—The methods of harvesting, grading, packing, storing, transporting, and selling fruits and vegetables are described. Statistics are given of the imports and exports of fresh, dried, and canned fruits, fresh and dried vegetables, and nuts. The types, operation, and significance of cooperative marketing agencies are discussed.

Meat marketing in Great Britain, J. E. Wrenn and E. C. Squire (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Trade Prom. Ser. 35 (1926), pp. IV+44, figs. 7*).—The domestic production, the total imports and the imports from leading countries, the methods of marketing foreign meats in England and Wales, the marketing of domestic livestock and meats in England, Wales, and Ireland, and the relation of livestock to agriculture in England and Wales are described. The marketing of American pork products in competition with such products from other countries is especially emphasized. A résumé of the British public health meat regulations is included.

Crops and Markets, [September–October, 1926] (*U. S. Dept. Agr., Crops and Markets, 6 (1926), Nos. 10, pp. 145–160; 11, pp. 161–176; 12, pp. 177–192; 13, pp. 193–208; 14, pp. 209–224; 15, pp. 225–240*).—The usual market information, tabulations, summaries, and notes are given for livestock, meats, and wool, fruits and vegetables, dairy and poultry, grain, hay, feed, cotton, and foreign crops and markets for the period August 23 to October 2.

Monthly Supplement to Crops and Markets, [September, 1926] (*U. S. Dept. Agr., Crops and Markets, 3 (1926), Sup. 9, pp. 273–304, figs. 4*).—The usual tabulations, summaries, and notes are given regarding crops, dairy products, cold storage holdings, fruit and vegetable shipments, livestock and livestock products, prices and price movements of important agricultural products, seeds, and exports of grain. Special articles are included on the beef cattle outlook and the outlook for winter wheat in 1926–27.

Prices and price indexes, 1913–1924, H. Marshall (*Ottawa: Canada Dept. Trade and Com., Bur. Statis., 1925, pp. 120*).—Price movements for 1924 of agricultural and other commodities are analyzed by groups, and wholesale prices for individual commodities and index numbers for commodities, grouped according to purposes for which used and origin, are given for 1913 to 1924, inclusive. Index numbers of security prices, of wholesale and retail prices in certain other countries, and of retail prices of items entering into a family budget are included.

Cotton (*Bur. Ry. Econ. [Wash., D. C.], Commodity Prices [etc.] Bul. 13 (1926), pp. 16, figs. 7*).—This bulletin is one of a series of studies on commodity prices in their relation to transportation costs, and deals primarily with the relation of the prices of the 1925–26 cotton crop and freight rates to representative consuming mill centers, the principal ports of export, and other destinations. Comparative prices of cotton for 1923–24, 1924–25, and 1925–26 and statistical data and charts on production, distribution, and consumption of

cotton in the United States and foreign countries over a period of years are included. The present study indicates (1) that there are marked fluctuations in prices paid producers from week to week, month to month, and season to season; (2) that such fluctuations are not uniform in the same general territory, are in excess of the freight rates to even the more distant consuming centers, and are not caused by freight rates; and (3) that the freight rates even on long distance hauls are only a small proportion of the price of cotton and do not retard the freedom of movement of the cotton.

The world wheat situation, April to July, 1926, J. S. Davis, M. K. Bennett, et al. (*Wheat Studies, Food Research Inst.* [*Stanford Univ.*], *2* (*1926*), *No. 10, pp. 325–356, figs. 6*).—A continuation of the studies previously noted (E. S. R., 55, p. 483) including a study of the international trade, new crop developments, price movements, visible supplies and carryovers, and the outlook for 1926–27.

A selected bibliography of publications, 1920–25, relating to the world wheat situation, J. S. Davis, E. C. Wright, et al. (*Wheat Studies, Food Research Inst.* [*Stanford Univ.*], *2* (*1926*), *No. 9, pp. 293–324*).—A selected bibliography on the economic aspects of the wheat situation classified under the heads of general, production, marketing, utilization, and national policies. It supplements the periodical publications list previously noted (E. S. R. 53, p. 593).

The decline in per capita consumption of flour in the United States (*Wheat Studies, Food Research Inst.* [*Stanford Univ.*], *2* (*1926*), *No. 8, pp. 265–292, figs. 8*).—From 1904 to 1919 the per capita consumption of flour appears to have decreased 10 per cent and from 1919 to 1923 12 per cent. This study of the statistics of flour production, flour disappearance, disappearance of wheat, consumption of other foods, total food consumption per capita, and changes in food consumption indicates that the decline has been due to four chief factors: (1) A tendency to replace cereals with sugar, (2) a decline in the total food requirements per capita, (3) a tendency to diversified diet, and (4) a shift to more expensive foods due chiefly to the increased prosperity among the laboring classes. While all the factors will probably continue to operate, the magnitude of the last three is not likely to be great. The replacing of cereals with sugar may continue to increase to a considerable extent.

Trends in slaughter and value of livestock since 1921, T. U. H. Ellinger (*Jour. Farm Econ., 8* (*1926*), *No. 3, pp. 324–346, figs. 10*).—A statistical study is made of the trends of production and prices of cattle, calves, hogs, and sheep, based on data collected by the U. S. Department of Agriculture from inspected packing houses as to the total number of animals purchased for slaughter, average live weight, and average cost per 100 lbs. The seasonal fluctuations are eliminated by the method of W. M. Persons,[4] using an arithmetic mean instead of the median link relative. Monthly index numbers for the entire livestock industry are computed, using Fisher's No. 353 formula[5] and the averages of the 60 monthly prices and the volume of slaughter data for 1921 to 1925, corrected for seasonal fluctuations as base figures.

Economic development of modern Europe, F. A. Ogg and W. R. Sharp (*New York: Macmillan Co., 1926, rev. ed., pp. XVI+861*).—This is a revised edition of a book previously noted (E. S. R. 40, p. 589), with six supplementary

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[4] *Correlation of Time Series.* *In* Handbook of Mathematical Statistics, H. L. Rietz et al. Boston: Houghton Mifflin Co., 1924, pp. 150–165, figs. 5.

[5] The Making of Index Numbers, I. Fisher. London: Isaac Pitman & Sons; Boston: Houghton Mifflin Co., [1924], 2. ed., rev., pp. XXXIII+526, figs. 68.

chapters on the World War and its aftermath, one of which deals with the population, food production, and agrarian reform since 1914.

[The Carmarthen Farmers' Cooperative Society], A. G. RUSTON and J. R. LEE (*Jour. Min. Agr. [Gt. Brit.], 33 (1926), No. 3, pp. 226–238, fig. 1*).—This society has been selected as a typical and successful example of a Welsh cooperative agricultural requisite or store society. Its organization, growth, operation, policy as to financing, prices, credit taken and given, working costs, investments, distribution of profits, etc., are described and discussed.

Contemporary agricultural law [Great Britain], A. J. SPENCER (*Jour. Roy. Agr. Soc. England, 86 (1925), pp. 128–140*).—A brief summary is given of the laws enacted and the court decisions during 1925 directly affecting agricultural interests.

[Proposed standard schedule form for] the world agricultural census of 1930 (*[Rome]: Internatl. Inst. Agr., 1926, pp. 44*).—The proposed standard form of schedule approved by the eighth general assembly of the International Institute of Agriculture is given, together with the report of the committee of the international scientific council of the institute appointed for the preliminary consideration of the draft schedules, the report of the committee of statisticians of the general assembly on the proposed standard form, and explanatory notes.

[Yearbook statistics of crops, livestock production, and trade (*U. S. Dept. Agr. Yearbook 1925, pp. 741–1485*).—As noted for the previous year (E. S. R., 54, p. 84), current statistics and summaries are given for the grains, fruits and vegetables, field crops other than grain, farm animals and their products, and foreign trade in agricultural products. Farm management and cost statistics and miscellaneous agricultural statistics are also given.

Cotton production and distribution, season of 1924–25 (*U. S. Bur. of the Census Bul. 158 (1925), pp. IV+65, figs. 2*).—Detailed tabulated statistics are given and discussed dealing with the production of cotton from the 1924 crop and the consumption, imports, exports, and stocks of cotton, the number of cotton spindles and active spindle hours, cotton seed received, crushed, and on hand, and the cottonseed products manufactured, shipped out, and on hand during the year ended July 31, 1925.

Cotton production in the United States, crop of 1925 (*U. S. Bur. of the Census, Cotton Prod. U. S., 1925, pp. 40*).—Tables are given showing the total production in the United States of Upland and Sea Island cotton and linters for 1899 to 1925, and the total production, amounts ginned to specific dates, and number of ginneries operating and idle by States for 1922 to 1925 and by counties for 1923 to 1925.

Horticultural manufactures, L. C. CORBETT, J. S. CALDWELL, W. STUART, W. R. BEATTIE, and L. B. FLOHR (*U. S. Dept. Agr. Yearbook 1925, pp. 601–622, figs. 5*).—Tables are given and discussed showing the distribution and extent of the fruit and vegetable drying industry in 1899, 1909, 1919, and 1921; the value of the principal canned products by five-year intervals from 1899 to 1919 and in 1921; and the packs of the more important canned fruits and vegetables in 1909, 1919, and 1921 by States. The vinegar, fruit juice, and specialized fruit and vegetable manufacturing industries, and the utilization of potatoes for starch and flour, are also discussed.

Agricultural statistics [Great Britain], 1925, R. E. STANLEY (*Jour. Roy. Agr. Soc. England, 86 (1925), pp. 141–156*).—The acreage, production, yield per acre, and value of the chief crops; numbers and prices of horses, cattle, sheep,

and hogs; imports of grain, meal, and meat for 1924 and 1925; and the monthly index numbers of agricultural products for 1925 are given, with comparative figures for previous years.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Agricultural part-time schools, J. A. LINKE ET AL. (*Fed. Bd. Vocat. Ed. Bul. 108 (1926), pp. VII+29, figs. 2*).—The part-time school group includes out-of-school farm boys, estimated at over 1,200,000, and for the most part composed of boys employed on farms who can attend school for only a part of their time and usually as a part of their regular working time. This bulletin outlines the methods for use in organizing and conducting agricultural part-time schools, gives suggestions as to the content of courses and methods of teaching and supervising farm practice, summarizes the minimum requirements for part-time schools, and outlines the procedure in conducting state-wide campaigns for such instruction and the ways in which such instruction may be worked into a school program.

[**Agricultural education in Canada**], L. S. KLINCK and G. G. MOE (*Sci. Agr., 6 (1926), No. 12, pp. 422–424, 428–431*).—The reports and recommendations presented to the sixth annual convention of the Canadian Society of Technical Agriculturists by the committee on educational policies as to agricultural colleges and schools and the teaching of agriculture in public and high schools and of the committee on graduate studies in agriculture are given.

Agricultural middle schools: A discussion on the progress made and experience gained since 1922, F. J. PLYMEN, L. L. DAS, G. R. HILSON, and G. P. HECTOR (*India Bd. Agr. Proc., 14 (1925), pp. 34–40, 88–95*).—The report of the committee of the board on progress and experience gained in middle agricultural schools since 1922, together with a discussion of the report, and reports on such schools in Punjab, Madras, and Bengal are given.

Business geography, E. HUNTINGTON and F. E. WILLIAMS (*New York: John Wiley & Sons; London: Chapman & Hall, 1926, 2. ed., rewritten, pp. XVI+616, figs. 155*).—This textbook, prepared with the cooperation of R. M. Brown and L. E. Chase for schools of commerce, commercial departments in colleges, and upper high school grades, is a rewritten second edition of that previously noted (E. S. R., 48, p. 193). It is divided into five parts dealing with the geographical factors and principles, the great products and typical communities, the business of the United States and Canada, the business of the continents, and statistical data.

FOODS—HUMAN NUTRITION

Nutritive value of fruits, vegetables, and nuts, C. L. HUNT (*U. S. Dept. Agr. Yearbook 1925, pp. 133–149*).—The place of fruits, vegetables, and nuts in the diet is discussed from the standpoint of the requirements of the body for protein, mineral substances, vitamins, and bulk. Of these requirements, that of efficient protein is shown to be the only one which can not be furnished chiefly by these groups of foods, but it is pointed out that even in this respect certain vegetables can play an important part in supplementing incomplete proteins. It is estimated that fruits and vegetables in variety and adequate in quantity to supply 20 per cent of the total calories are sufficient to supply the necessary mineral matter, vitamins, and bulk if the rest of the diet is well proportioned. If milk supplies less than 6 or 7 per cent of the total calories, the deficiency in calcium can be made up by the liberal use of dried beans, cauliflower, Swiss chard, oranges, and certain other fruits and vegetables.

Green leaf vegetables (particularly spinach), potatoes, and fruits in general are recommended to increase the iron. Vegetables selected with reference to the need of minerals are thought to furnish sufficient vitamins A and B, while an abundance of vitamin C can easily be secured by a liberal use of potatoes and a limited use of fresh citrus fruits and raw green-leaf vegetables. The chief uses of nuts are as food accessories or appetizers, emergency rations as in the diet of hikers, mountain climbers, etc., and as the chief source of fat in cakes and salads. A pound of shelled nuts of the oily varieties is said to supply about ⅔ lb. of fat and to be equal for shortening or enriching purposes to 1¼ cupfuls of olive oil or ¾ lb. of butter.

The value of nutrition classes to the undernourished child.—A comparative study, A. D. KAISER, H. J. NORTON, and E. M. WALKER (*Amer. Jour. Diseases Children, 31 (1926), No. 3, pp. 386–394, figs. 2*).—This discussion of the ultimate value of a school nutrition program according to the method introduced by Emerson (E. S. R., 53, p. 563) is based upon records obtained in the public schools of Rochester, N. Y., where nutrition classes have been conducted since 1921, and where an opportunity has been afforded to determine whether the remarkably accelerated gains usually resulting from a definite nutrition program are of permanent value.

In two groups of over 300 children who were in the nutrition class for 20 weeks and an equal number of underweight children not receiving extra food, a comparison of the weights at the beginning and end of the feeding period, and 6 and 12 months later showed that in general the improvement resulting from the nutrition class was not permanent. In another study in which attention was paid to the extent of underweight at the beginning of the nutrition work, it appeared that the most permanent improvement took place in the children who were 10 per cent or more underweight at the beginning.

To secure permanent results in school nutrition work the cooperation of the parents in regulating the child's habits and continuing the nutritional régime is considered to be most essential. It is recommended that the nutrition program be applied to the whole school instead of only to the underweight children in order to encourage the well-nourished child to remain so as well as to improve the condition of the undernourished child.

Studies in nitrogen and sulphur metabolism, H. E. C. WILSON (*Biochem. Jour., 20 (1926), No. 1, pp. 76–83*).—The investigation previously noted (E. S. R., 53, p. 762) has been extended to a study of the capacity of gelatin for sparing body protein when ingested during starvation, of the use to which gelatin is put under such circumstances, of the influence of meat extractives on protein metabolism with a nitrogen-free diet, and of the influence of excess water ingestion on protein metabolism.

The same methods were employed as in the previous study, the author himself being the subject. After the establishment of an output of 3 gm. of nitrogen per day on a nitrogen-free diet of tapioca and olive oil, no food was taken for 4 days except on the second day when 70 gm. of gelatin was ingested in three portions. At the end of the starvation period the nitrogen-free diet was resumed until the nitrogen output had returned to its original level. The effect of meat extractives was tested by adding 25 gm. to the nitrogen-free basal diet on the fifth day. To determine the effect of water, three series of experiments were conducted on basal diets of bread and cheese, bread and gelatin, and bread and dried eggs, respectively. On each of these diets there were two water-drinking days when 2,000 cc. in the first and 2,800 cc. in the second and third experiments were ingested. From the analyses of urinary nitrogen, sulfur, and phosphorus, the author draws the following conclusions:

"A protein such as gelatin, when ingested during starvation, can be retained in part for at least 6 days. It is probable that the retention takes place in some

complex form and not as the free amino acids. Meat extractives ingested during nitrogen starvation are in part retained. The material retained does not correspond in composition to muscle tissue. Extractives further seem to exercise some kind of inhibitory influence on nitrogen catabolism. Excess water ingestion increases the output of nitrogen in the urine by stimulating the catabolism of the nitrogen moiety of the protein molecule. The capacity of the tissues to retain protein also seems to be stimulated. Further evidence is adduced in favor of the view that in the storage of protein the sulfur is retained first."

The minimum endogenous nitrogen metabolism, M. Smith (*Jour. Biol. Chem., 68 (1926), No. 1, pp. 15–31*).—The chief purpose of this investigation was to determine the absolute minimum total nitrogen excretion in the urine of a normal adult maintained on a high caloric practically nitrogen-free diet consisting of a bread made of cornstarch, India gum, yeast, sugar, lard, and salt supplemented by succulent vegetables, fruits, and sweetened lemonade. The experiments covered a week on unrestricted diet, followed by 25 days on the low nitrogen diet. Urinary analyses were made daily, blood analyses occasionally, and strength tests and basal metabolism determinations at frequent intervals. For purposes of comparison, data from the literature on the minimum nitrogen excretion in the urine and feces have been tabulated.

The lowest nitrogen excretion in the urine thus far reported was obtained in the present study, 0.0242 gm. The total nitrogen balance averaged —3.34 gm. throughout the experiment and the total loss of nitrogen 80.08 gm. In spite of this the subject led an active life during the experimental period and gained slightly in weight. The strength tests showed that the total strength remained quite constant until almost the end of the experiment, when there was a drop of about 5 per cent attributed to lessened interest in the experiment rather than to real loss in strength. The basal metabolism figures were 11 per cent below the Harris-Benedict standard at the beginning of the experiment and 7 per cent at the end.

It is pointed out that the urinary nitrogen does not represent the true minimum on account of the small amount of nitrogen in the food which would appear in the urine chiefly as urea and ammonia, and that the true value can be obtained by subtracting the food nitrogen from the urea and ammonia nitrogen. On the last 4 days of the experiment these differences were —0.20, —0.18, —0.12, and —0.25 gm., respectively. The author advances the theory that this loss represents chiefly discarded amino groups from the arginine molecules which are used for the formation of creatine. "This theory reduces the nitrogenous metabolism of the muscles to a very simple conception. As long as the energy requirements of the muscle cells are supplied by carbohydrate and fat, their chief nitrogen demands consist of the replenishment of a small amount of creatine from the amino acid arginine. The protein or amino acid requirements for glandular metabolism would seem to be almost negligible under conditions where the energy is supplied by carbohydrate and fat. Muscle cells and particularly gland cells require a certain amount of purine nitrogen, but either this is a very small quantity or the body cells have marked powers to conserve this form of nitrogen or to resynthesize the products of purine catabolism."

Maintenance values for the proteins of milk, meat, bread and milk, and soy bean curd, M. S. Rose and G. MacLeod (*Jour. Biol. Chem., 66 (1925), No. 2, pp. 847–867*).—This is the complete report of an investigation which was noted from a preliminary report covering a part of the work (E. S. R., 51, p. 865). The entire study included 8 experiments of from 12 to 15 days' duration on four young women subjects.

"The evidence on the whole indicates that the nitrogen balance can be maintained with milk, meat, or white bread and milk in amounts to contribute each half of the protein, with a protein intake which is not over 85 per cent of the average maintenance requirement of adults, but that the efficiency of meat is slightly less than that of milk or bread and milk. The high fecal nitrogen on the soy bean diet may be interpreted to mean a lower biological value, although the soy bean must be regarded as very efficient, inasmuch as equilibrium was maintained on a very low intake. This point requires further investigation."

The determination of cystine by means of feeding experiments, H. C. SHERMAN and E. WOODS (*Jour. Biol. Chem., 66 (1925), No. 1, pp. 29–36, fig. 1*).—The plan of the investigation reported in this paper was to apply the method of feeding experiments with rats to the quantitative determination of cystine by using as a basal diet one in which whole-milk powder furnished practically all of the protein. In a previously reported study by Sherman and Merrill (E. S. R., 53, p. 562), cystine had been shown to be the first limiting amino acid of the proteins of milk. This being the case, definite growth response would be expected to result from the addition to the basal diet of definite amounts of cystine. With the growth response thus determined, it was reasoned that it would be possible to determine the cystine content of a protein such as casein by comparing the growth response to definite amounts of casein with that induced by the cystine. The basal diet used consisted of whole-milk powder 16.7, cod-liver oil 1, dried brewers' yeast 1.65, Osborne and Mendel's salt mixture 1.65, and starch 79 per cent. A period of 6 weeks following weaning was taken as the experimental period.

With pure cystine added in the proportion of 0.01 to 0.2 per cent of the diet, the relationship between the rate of growth and the amount of cystine added was found to be essentially arithmetical up to an addition of at least 0.025 per cent and probably up to 0.04 per cent cystine, with resulting increased gains of 10 and 17 gm., respectively, in the 6 weeks. Parallel experiments with graded additions of casein gave correspondingly graded responses in the rate of growth.

It is concluded that within the range in which the growth response was in arithmetical proportion to the amount of added cystine the response may be taken as a measure of the amount of cystine furnished by the casein. This would indicate that casein contains not less than 1.3 nor more than 2.5 per cent of cystine. It is thought possible to extend the general principles of this method to the quantitative determination of other nutritionally essential amino acids.

Some observations upon the rôle of cystine and certain mineral elements in nutrition, E. WOODS (*Jour. Biol. Chem., 66 (1925), No. 1, pp. 57–61*).—The above-noted investigation, together with others from the same laboratory, is considered to throw some light on the question of the dietary deficiencies of milk. It was noted that the tissues of young rats stunted by feeding upon the basal diet deficient only in cystine showed a remarkably good appearance at autopsy, and that rats which had been kept on this diet for a considerable period and then returned to a normal diet were able to resume growth at a normal rate and to reproduce and rear young. Records are summarized of other animals on diets of whole milk alone, whole milk plus 1 per cent salt, and whole-milk powder supplemented with whole wheat and salt. These show that the exclusive milk diets were not satisfactory for successful reproduction, but that the failure appeared to lie more in the suckling than in the production

of the young. Whole wheat appeared to be a particularly good suppliment to whole milk. This is explained as follows:

"It seems probable that there may be a relative shortage of the less prominent mineral elements which may be necessary for normal gland secretion, or that the proper mineral balance for membrane equilibrium can not be maintained with maximum ease and efficiency. The fact that the cystine-stunted animals, which had had the benefit of the less prominent mineral elements contained in the Osborne and Mendel salt mixture of the cystine-limited diet, recovered with noticeably successful suckling of their young gives added weight to this view of the mineral factors of the diet."

The excretion of normal urine sugar, N. R. Blatherwick, M. Bell, E. Hill, and M. L. Long (*Jour. Biol. Chem., 66 (1925), No. 2, pp. 801–810*).—The literature on the normal sugar (or reducing substances) in the urine is reviewed, and data are reported on the total reducing substances and fermentable sugar as determined by the method of Benedict and Osterberg (E. S. R., 49, p. 859) in the urine of three young women on a uniform basal diet with the addition of commercial and pure glucose, respectively, and on diets varying in protein content but with the same amount of glucose-formers.

In the first subject the ingestion of pure glucose caused an increased excretion of fermentable sugar only when at least 300 gm. was taken, and of commercial glucose in smaller amounts. Nonfermentable sugars were not increased by either type of glucose. In the second subject both pure and commercial glucose caused an increase in fermentable but no increase in nonfermentable sugar. In the third subject there was an increase in the output of both types following the ingestion of commercial glucose.

On the diets differing in the amount of protein the largest amounts of fermentable sugar were obtained on the low protein and high carbohydrate diet. In general the amount of nonfermentable reducing substances was highest on the high protein diet, thus indicating that the nonfermentable reducing substances may be largely dependent upon protein metabolism.

The respiratory metabolism in infancy and in childhood, I, II (*Amer. Jour. Diseases Children, 31 (1926), No. 3, pp. 323–356, figs. 2*).—The first two papers of a series of studies on the respiratory exchange in children are given as follows:

I. *Basal metabolism of children*, S. Z. Levine and J. R. Wilson (pp. 323–334).—The apparatus and technique employed in the investigations to be reported are described, and data are given on the basal metabolism of 5 normal children between 6½ and 10 years of age, an overweight girl of 7 years, and a diabetic boy of 11 years.

The weights of the 5 normal children, 4 girls and 1 boy, varied from −19 to +18 per cent from the average figures derived from the height-weight tables for age of Baldwin and Wood. The minimal energy requirements ranged from 39.3 to 43.8 calories per square meter per hour and between 38 and 41.4 calories per kilogram per 24 hours. The values averaged within 6 per cent of the standards proposed by Benedict and Talbot (E. S. R., 45, p. 561). Based on standing height as suggested by Benedict (E. S. R., 53, p. 862), the variations were greater, ranging from −13 to +11 per cent for the 4 girls. The figures obtained for the 1 subject who was 65 per cent overweight were 34 per cent below the average figures referred to body weight, 17 per cent above those for standing height, and 5 per cent below those for body surface. The diabetic boy was 18 per cent below the average weight and his basal metabolism was from 20 to 26 per cent below all of the standards.

Basal metabolism determinations were conducted on 1 subject 5¼ and 13 hours after meals of identical composition and with all other conditions the

same. The values obtained were 32.4 and 33.4 calories per hour, respectively, thus confirming the conclusion of Bauer and Blunt (E. S. R., 51, p. 556) and of other workers that there is no appreciable increase in heat production 4 to 6 hours after a light meal.

II. *Ketosis and the respiratory exchange in children*, J. R. Wilson, S. Z. Levine, and H. Rivkin (pp. 335–356).—This study is concerned chiefly with the relation between ketosis in children as measured by the excretion of ketone bodies in the urine and by the ketogenic balance of metabolized foodstuffs as determined in the respiration chamber. Varying degrees of ketosis were induced in 6 children by fasting and by diets containing increasing proportions of fat to carbohydrate. One or more calorimeter observations were made after the children had been on each diet for 3 days or longer and from 4 to 7 observations on each child during the starvation experiments, which were continued to the point of abnormal excretion of ketone bodies in the urine. The most significant results obtained were as follows:

Ketonuria appeared in the children at consistently lower metabolic fatty acid-glucose ratios than is the case with adults and was more severe at a given metabolic ratio. Higher proportions of carbohydrate and lower of fat than contained in the diet were oxidized, and this discrepancy was most marked the higher the fat content of the diet. The sugar and carbon dioxide content of the blood fell during fasting and during the ingestion of low carbohydrate-high fat diets. It is concluded that the tendency of children to develop ketosis may be counteracted by giving diets high in carbohydrate and low in fat, especially in conditions of high metabolism.

The effect of orange juice on the calcium, phosphorus, magnesium, and nitrogen retention and urinary organic acids of growing children, M. S. Chaney and K. Blunt (*Jour. Biol. Chem.*, *66* (*1925*), *No. 2*, *pp. 829–845*).—The addition to an ordinary diet of from 600 to 700 cc. daily of unstrained juice from California Valencia oranges was found to exert a favorable effect upon calcium, phosphorous, and magnesium retention, an increase in nitrogen assimilation, and striking gains in weight in two girls, 10 and 11 years of age, who were the subject of the metabolism studies reported in this paper.

"How the orange brings about the favorable nitrogen and mineral retention is unknown. The effect may be due to one or several of the following factors: The vitamins, which promote the economical use of elements already present but not efficiently used; the additional calcium and phosphorous, which induces the retention of these and possibly other elements in excess of the amount added; some factor which stimulates a greater flow of hydrochloric acid in the stomach, causing a greater acidity in the upper part of the small intestine and a greater absorption of mineral; or the basic residue, which may favor normal activities in the growing body."

Vitamins in canned foods, IV, V (*Indus. and Engin. Chem.*, *18* (*1926*), *Nos. 1*, *pp. 85–89*, *figs. 6*; *3*, *pp. 302*, *303*, *fig. 1*).—These papers continue the series previously noted (E. S. R., 53, p. 764).

IV. *Green peas*, W. H. Eddy, E. F. Kohman, and V. Carlsson.—Raw ungraded peas are reported to be half as rich in vitamin A as butter, and canned peas to be richer in vitamin A than string beans, lettuce, tomatoes, or orange juice, about equal to carrots, and less rich than butter, cod-liver oil, egg yolk, and spinach. Ordinary cooking and canning are considered to have no appreciable effect on the vitamin A content.

Green peas are considered to be richer in vitamin B, weight for weight, than either milk or tomato juice and to suffer very little loss of this vitamin in home cooking or processing for canning, although slight losses may occur with too

long a blanching process. The mature peas tested were richer in vitamin B than small immature ones.

In the vitamin C experiments, the minimum protective doses for guinea pigs are given as 2 gm. daily for raw ungraded peas, 5 gm. for the same home-cooked, 3, 3, and 4 gm., respectively, for Nos. 1, 3, and 6 canned peas, and 3 gm. for canned peas reheated for the table. Blanching produced a detectable but not pronounced loss in vitamin C.

Green peas fed daily in 3-gm. amounts did not prevent or ameliorate the symptoms of rickets in rats on the Sherman-Pappenheimer rickets-producing diet 84.

V. *Peaches*, E. F. Kohman, W. H. Eddy, V. Carlsson, and N. Halliday.—The minimum protective dose against guinea pig scurvy of raw peaches purchased in the New York market in the early fall was estimated to be about 5 gm. daily. California peaches canned under ordinary commercial conditions were as potent in vitamin C as fresh peaches. Canned peaches from which the oxygen had been removed before canning by methods similar to those used for apples in a previous study of the series (E. S. R., 53, p. 566) were not appreciably richer in vitamin C than those canned without this treatment. Peaches cooked in an open kettle for 15 minutes contained less vitamin C than the fresh or canned product, 10 gm. of the cooked being practically equivalent to 2.5 gm. of the raw.

The vitamin B studies were inconclusive as to the content of this vitamin in peaches, although indicating a very low content. From incomplete studies on vitamin A, the conclusion was drawn that peaches are about one-third as rich in this vitamin as is butter.

Effect of excessive amounts of vitamin B on the basal metabolism of rats of different ages, H. H. Mitchell and G. G. Carman (*Amer. Jour. Physiol., 76 (1926), No. 2, pp. 385–397, fig. 1*).—Experimental data are reported indicating that the ingestion of excessive amounts of vitamin B does not modify appreciably the basal heat production of rats. "Therefore, in so far as the basal heat production is a measure of 'vitality,' it may be concluded that the ingestion of amounts of vitamin B in excess of the minimum requirements for growth and continued well-being does not benefit an animal."

Ultra-violet irradiation in the activation of cholesterol and foods, A. F. Hess and M. Weinstock (*Lancet [London], (1926), I, No. 1, pp. 12–14*).—Essentially noted from another source (E. S. R., 54, p. 92).

TEXTILES AND CLOTHING

Distribution of textiles (*Harvard Univ., Bur. Business Research Bul. 56 (1926), pp. XI+196, figs. 5*).—This book indicates the relative quantities of woven goods, including woolen and worsted cloth, rugs and carpets, silk cloth, ribbons, and threads, and cotton cloth purchased by garment manufacturers and other cutters-up, industrial and institutional purchasers, wholesalers, and retailers, as determined by a study of the Harvard Bureau of Business Research during 1925. Statistical methods and the size of orders for cotton cloth are also considered.

The hygroscopic properties of colloidal fibres and their relation to technical processes, S. G. Barker, H. R. Hirst, and A. T. King (*Jour. Textile Inst., 17 (1926), No. 8, pp. P137, P138*).—A summary account is given of a paper which showed that wool fibers possess the usual characteristics of colloids and that wool structure can apparently be represented by an elastic framework filled with a viscous medium. In a discussion of the effect of moisture absorption on the viscous phase, it is stated that wool is a perfectly elastic material and

completely recovers from strain even up to its breaking point. The increase of thermal conductivity of dry material for an increase of moisture content of 1 per cent of the dry weight is shown to range from 0.0000017 to 0.000002 for wool. The electrical conductivity increases with moisture content, and absolutely dry fibers appear to be nonconducting. The relation between density and regain and the swelling of wool fibers (E. S. R., 54, p. 896) and the mechanism of the heat of wetting are also dealt with.

Investigation of the fading of worsted clothes dyed with typical dyes of different chemical constitution, exposed to sunlight and air in India and in Great Britain, showed a relation between loss of color and the atmospheric moisture. The sensitiveness of wool to bacterial damage was shown to reach a maximum at the point of extreme saturation with moisture.

The measurement of the resistance of yarns to abrasion, A. E. Owen and J. Locke (*Brit. Cotton Indus. Research Assoc., Shirley Inst. Mem., 5 (1926), No. 17, pp. 207–222, pl. 1, figs. 5*).—The technique of abrasion tests is described, with comment on the results. Both the oscillating stress tester (E. S. R., 51, p. 235) adapted for abrasion testing and a rotating shaft were employed, and data on typical yarns were obtained. It appeared that the results of the abrasion tests can be rationally expressed as a single numerical quantity, viz, the arithmetical mean of the logarithms of the numbers of rubs endured by all the specimens of a sample.

The importance of hair weight per centimetre as a measurable character of cotton and some indications of its practical utility, W. E. Morton (*Brit. Cotton Indus. Research Assoc., Shirley Inst. Mem., 5 (1926), No. 15, pp. 177–192, pls. 3, figs. 4*).—This paper indicates the significance of fiber weight per centimeter in relation to the quality of cottons and as a means of facilitating their identification, especially when in yarn or fabric. Fiber weights per centimeter and other measurements are tabulated for samples covering a wide range of cotton varieties.

An experimental method for investigating the thermal properties of cotton fabrics, J. Gregory (*Brit. Cotton Indus. Research Assoc., Shirley Inst. Mem., 5 (1926), No. 16, pp. 193–206, figs. 11*).—"The essential requirements of fabrics for maintaining the body at normal temperature under tropical conditions are shown to be high reflecting and emissive powers, low transmitting power for radiant energy, and high permeability to moisture." Investigations are reported on the thermal properties of cotton fabrics designed for tropical use.

The total heat reflected in one typical fabric about equaled the total heat transmitted. In tests of dry fabrics the most transparent permitted about five times as much heat to pass as the least transparent, due to differences in construction involving filling, weaving, etc. A certain degree of irregularity from place to place along the length of a fabric in the heat transmitted was independent of the amount of heat transmitted. Washing the fabric showed that the greatest increase in heat transmitted occurred when most filling was removed, and heavily filled fabrics lost their heat insulating value almost entirely on washing. Some unfilled fabrics transmitted less heat after washing owing to shrinkage. A heavy fabric little affected by washing seemed most suitable for tropical use.

With four fabrics examined the heat transmitted decreased in direct proportion to the increase in relative humidity of the atmosphere with which the fabric was in equilibrium. The mean decrease on changing from dryness to saturation was 22.7 per cent, but the decrease was greatest with those fabrics transmitting least heat when dry. The effect of moisture content on the heat reflecting power appeared to be insignificant.

The determination of deliquescent substances in sized cotton materials, S. M. NEALE (*Brit. Cotton Indus. Research Assoc., Shirley Inst. Mem., 5 (1926), No. 12, pp. 151–156, fig. 1*).—Methods described for the determination of chlorides, zinc, magnesium, and glycerol are said to give trustworthy results with quantities of sized material easily dealt with on the laboratory scale.

The deliquescent properties of magnesium chloride, of calcium chloride, and of glycerol, E. SWAN (*Brit. Cotton Indus. Research Assoc., Shirley Inst. Mem., 5 (1926), No. 13, pp. 157–166, figs. 12*).—The measurements recorded on the hygroscopic properties of magnesium chloride, calcium chloride, and glycerol were made preliminary to a study of their behavior in textile materials. Data from an examination of size and sized yarns containing deliquescents are cited to show the need for caution in interpreting measurements made on the pure substances.

How to weave linens, E. F. WORST (*Milwaukee: Bruce Pub. Co., 1926, pp. 166, figs. 274*).—Designed for the amateur weaver, this book gives a popular exposition of the processes from the flax field to the loom necessary to produce linen cloth. The tie-up of harnesses and directions for threading up the loom for harness drafts of different number are treated in detail.

Artificial silks.—Vol. I, Processing in the skein, J. H. HAEBRY (*Palisade, N. J.: Textile Library Co., 1924, vol. 1, pp. [7]+301+[24], fig. 1*).—The several chapters in this treatise deal with the history and manufacture of artificial silks, manufacturing methods, mill handling, uses, physical and chemical properties, chemical tests and methods, skein dyeing, sizing and finishing, dressing and drying, and dyeing machinery and equipment. Damages in bleached calico due to mineral oils and waxes, sizings, colorings, and other causes are discussed in an appended chapter.

The cause of faults in piece dyeing, J. S. HEUTHWAITE (*Amer. Dyestuff Rptr., 15 (1926), No. 17, pp. 642–644*).—Frequent mistakes in wool piece dyeing described, with causes and methods of prevention, include insufficient steaming, faulty decatizing, heat creases, bad preparation, mildew, and stripping.

The dyeing of worn garments and redyeing of new materials, P. SCHUTZE, trans. by A. P. SACHS (*Deut. Färber Ztg., 62 (1926), No. 26, pp. 652, 653; trans. in Amer. Dyestuff Rptr., 15 (1926), No. 17, pp. 640, 641*).—Preliminary treatments are outlined and specific information given for silk, wool, cotton, linen, and mixtures and for damaged new goods.

MISCELLANEOUS

Agriculture Yearbook, 1925, W. M. JARDINE ET AL. (*U. S. Dept. Agr. Yearbook 1925, pp. V+1537, figs. 337*).—This contains the report of the Secretary of Agriculture, nine special articles dealing with the fruit and vegetable industry abstracted elsewhere in this issue, miscellaneous lists, and the usual statistics noted on pages 717 and 787.

Federal and State research and information service, H. P. GOULD (*U. S. Dept. Agr. Yearbook 1925, pp. 711–718*).—This article briefly describes some of the ways in which the U. S. Department of Agriculture, the agricultural colleges and experiment stations, and other agencies assist in the promotion of horticulture.

Report of the Northeast Experiment Station, Duluth, 1924 and 1925, M. J. THOMPSON (*Minnesota Sta., Duluth Substa. Rpt. 1924–1925, pp. 40, figs. 8*).—The experimental work reported is for the most part abstracted elsewhere in this issue. Meteorological data are included.

Report of West Central Experiment Station, Morris, 1924, P. E. MILLER (*Minnesota Sta., Morris Substa. Rpt. 1924, pp. 44*).—The experimental work reported is for the most part abstracted elsewhere in this issue.

NOTES

Arkansas University and Station.—Work on the new agricultural building now being erected at a cost of $250,000 is progressing rapidly, and it is expected that by June, 1927, several of the departments will be installed. The new building is expected to house the dean's offices, the bulletin room, the editor's offices, the departments of rural economics and sociology, plant pathology, agronomy, horticulture, and entomology, and the agricultural library.

George W. Ware has been appointed in charge of the Fruit and Truck Substation at Hope, beginning December 1.

Florida University and Station.—The contract for the first unit of the new horticultural building has been let, and work will be begun at an early date. For this unit a State appropriation of $125,000 is available. When complete the building will house the agricultural extension service, the State plant board, the station library, and the mailing room and editorial offices, the remaining rooms to be used for class work by the College of Agriculture.

Iowa College and Station.—F. W. Beckman, head of the department of journalism and bulletin editor of the station, has resigned to become managing editor of *The Farmer's Wife*, effective February 1, 1927. Professor Beckman has been a pioneer in the ranks of station editors, and during his fifteen years' service the department of journalism has grown from a one-man to a four-man staff.

Missouri University.—A bronze tablet in memory of the late Dr. Henry J. Waters was presented to the university December 9 by the county agents of the State at their annual conference. The tablet is located in Waters Hall, the agricultural building named in honor of Dr. Waters since his death, and bears the following inscription:

In Memory of
Henry Jackson Waters, 1865–1925
Class of 1886
Dean, Missouri College of Agriculture, 1895–1909
Presented by Missouri County Agents' Association, 1926
In Remembrance of
A True Friend of Missouri Agriculture

Montana College and Station.—I. J. Jensen, assistant professor of agronomy in the college and assistant agronomist in the station, has been placed in charge of the work at the Judith Basin Substation of the Office of Dry Land Agriculture, U. S. D. A. A. Osenburg, who has been stationed at this substation, has been transferred to Newell, S. Dak. LeRoy Powers, who this year received his M. S. degree from the Washington College, has been appointed assistant in agronomy in the college and station.

Nebraska University.—A new student activities building has been completed on the agricultural campus at a cost of $180,000. This building is two stories high, with showers and lockers, physical education rooms, a kitchen, and offices on the first floor, and a men's gymnasium, a stage for auditorium use, and a

gallery seating 700 people on the floor above. This building will be used for physical education, general social purposes, large auditorium meetings, and the like.

At the recent State election, Frank Taylor was reelected a member of the board of regents for a term of six years. Sidney D. Long of McCook was elected regent for a similar term, succeeding George Seymour of Elgin.

Nevada Station.—The three-story brick building formerly occupied by the station has been removed to a new location, approximately 1,200 ft. distant, and so set up on a new cement foundation as practically to provide an additional story. In its new position, the building will be used for the administrative offices and for the central headquarters of project work conducted under the Purnell fund, considerable space for the development of these projects being provided.

The department of veterinary science has been given new quarters in the agricultural building. An interesting development in the department has been the discovery of a vaccine which promises to prevent the occurrence of the red water disease in cattle. This disease is caused by the microorganism *Clostridium hemolyticum bovis*, and a curative serum was perfected in 1925. The development of a successful preventive vaccine will bring the research work in connection with this disease to a conclusion.

New York State Station.—Glen P. Van Eseltine, a systematic botanist formerly associated with the Smithsonian Institution, has been appointed associate in research (horticulture) to fill the vacancy occasioned by the resignation of Dr. Alwin Berger.

Oregon College.—A radio home study course on farm crops, supplemented by assigned reading, is being offered.

Rhode Island College.—Under a recent State appropriation of $600,000, a $200,000 engineering building (with $45,000 for equipment), a library and auditorium to cost $140,000, a $100,000 gymnasium and drill hall, and a $75,000 men's dormitory are to be erected.

Association of Land-Grant Colleges and Universities.—In addition to the general officers enumerated on page 707, the following sectional officers were elected at the Washington meeting, November 16–18, 1926: Agriculture, H. G. Knight of West Virginia, chairman, F. Garcia of New Mexico, vice chairman, and L. N. Duncan of Alabama, secretary; engineering, A. A. Potter of Indiana, chairman, and R. A. Seaton of Kansas, secretary; and home economics, Ava B. Milam of Oregon, chairman, and Alba Bales of North Dakota, secretary. In the three subdivisions of the section on agriculture, C. A. Willson of Tennessee and H. L. Walster of North Dakota were chosen chairman and secretary, respectively, for that of resident teaching, L. E. Call of Kansas and H. W. Barre of South Carolina for experiment station work (with E. W. Allen of the Office of Experiment Stations as recording secretary), and P. H. Ross of Arizona and L. S. Merrill of Maine for extension work.

In the standing committees, A. C. True of the Department of Agriculture was reappointed chairman of that on instruction in agriculture, home economics, and mechanic arts for a three-year term, and new appointments for the same period were made of E. J. McCaustland of Missouri and Margaret M. Justin of Kansas. E. M. Lewis of Massachusetts and A. A. Murphree of Florida were appointed to the committee on college organization and policy, succeeding F. P. Anderson of Kentucky and B. Knapp of Oklahoma. J. T. Jardine of Oregon became chairman of the committee on experiment station organization and policy, with L. E. Call of Kansas and H. W. Barre of South Carolina succeeding T. P. Cooper of Kentucky and H. G. Knight of West Vi

ginia. In the *committee on extension organization and policy*, H. J. Baker of New Jersey and W. H. Brokaw of Nebraska were succeeded by M. S. McDowell of Pennsylvania and A. J. Meyer of Missouri, with F. W. Peck of Minnesota as chairman. J. C. Futrall of Arkansas and J. L. Coulter of North Dakota succeeded J. M. Thomas of New Jersey and H. L. Kent of New Mexico on the committee on military organization and policy, and M. S. Ketchum of Illinois took the place of G. W. Bissell of Michigan on that of engineering *experiment stations*.

For the joint committees, B. L. Hartwell of Rhode Island was succeeded on that on projects and correlation of research by E. D. Merrill of California. H. W. Mumford of Illinois was succeeded on that dealing with publication of research by M. J. Funchess of Alabama.

A reorganiation of the special committees on national research projects was also effected. The constitution of these committees is now as follows: Vitamin content of food in relation to human nutrition, Louise Stanley of the Bureau of Home Economics, R. A. Dutcher of Pennsylvania, A. G. Hogan of Missouri, R. W. Thatcher of New York, Sybil L. Smith of the Office of Experiment Stations, and L. S. Palmer of Minnesota; rural home management studies, Margaret M. Justin of Kansas, Hildegarde Kneeland of the Bureau of Home Economics, H. G. Knight of West Virginia, Mary L. Matthews of Indiana, M. L. Nichols of Alabama, Faith M. Williams of New York, and Eloise Davison of Iowa; rural social organizations and agencies essential to a permanent and effective agriculture, G. I. Christie of Indiana, E. D. Sanderson of New York, C. C. Taylor of North Carolina, Eben Mumford of Michigan, E. L. Morgan of Missouri, C. J. Galpin of the Bureau of Agricultural Economics, and J. H. Kolb of Wisconsin; factors which influence the quality and palatability of meat, F. B. Mumford of Missouri, S. Bull of Illinois, H. J. Gramlich of Nebraska, M. D. Helser of Iowa, E. W. Sheets of the Bureau of Animal Industry, P. F. Trowbridge of North Dakota, C. R. Moulton, and F. G. King of Indiana; and distribution and marketing of farm products and surpluses of farm products, T. P. Cooper of Kentucky, J. D. Black of Minnesota, H. E. Erdman of California, L. C. Gray and N. A. Olsen of the Bureau of Agricultural Economics, G. F. Warren of New York, W. E. Grimes of Kansas, C. L. Stewart of Illinois, L. P. Gabbard of Texas, J. I. Falconer of Ohio, B. H. Hibbard of Wisconsin, and R. J. McFall of Massachusetts.

American Society of Agronomy.—The nineteenth annual meeting of this society was held at Washington, D. C., November 18 and 19, 1926.

The president's address was given by Director C. G. Williams of the Ohio Station on What Can Agronomists Contribute to the Solution of the Agricultural Problem. According to many who have offered solutions, the agricultural problem of the present day is largely due to the surplus production of certain farm products. The natural means of controlling surplus crops include reduction in acreage, grading and culling, and cooperative marketing. While high prices have the merit of allowing a margin between the cost of production and selling price, they restrict the demand. Taking as examples current practices in the industrial world, the farmer may lower his production costs, thus increasing his profits without greatly disturbing the selling price.

Agronomists may aid in the solution of the agricultural problem by advocating the cultivation of fewer acres of crops likely to yield surpluses and the devotion of the land released to special crops, legumes, grazing, and forestry. The cost per unit may be reduced by growing crops adapted to the soils and climate, better varieties, the correct usage of fertilizer as to formula, rate of application, and place in the rotation, proper crop rotations, adjustment of the

cereal: legume ratio, and cultivation of more acres per man. More attention should be paid to the local and domestic markets, i. e., the city, county, and State markets as compared with foreign markets. In concluding Director Williams advised the expansion of the home market and adjusting production to meet its demands.

The opening session included papers on Corn Borer Research in Ohio, by L. L. Huber and R. M. Salter; Economics of Permanent Pasture Improvement, by J. W. White; The Present Status of Legume Inoculation, by A. L. Whiting; and The Present Status of Soil Investigations in the Field, by C. F. Marbut. The remainder of the program was given over to five symposia.

A symposium before the society as a whole dealt with the publication of results of agronomic research and was led by R. W. Thatcher, who also discussed the question, Should the Results of Agronomic Research Be Published in Bulletins, or in Scientific Journals, or Both? Other papers in this group were The Technical Bulletin as a Writer Sees It, by C. R. Ball; Characteristics of a Good Journal Article, by M. C. Merrill; Methods of Graphic Representation of Experimental Data, by J. D. Luckett; Making Photographs for Illustration in Published Articles, by C. H. Hanson; and Popular Presentation of the Results of Agronomic Research, by J. F. Cox.

In the soils sectional program the first symposium dealt with potash and was led by C. A. Mooers. Papers were also given on The Geography of Potash Needs of the Soil Provinces, by J. N. Harper; Relative Crop Response, by B. L. Hartwell; Potash in Relation to Plant Diseases, by G. N. Hoffer; Influence of Liming on Availability of Soil Potash, by W. H. MacIntire; and Potash in Relation to Quality of Crop, by G. L. Schuster.

A symposium on soil organic matter was led by F. E. Bear and included papers on Some Physical and Physico-Chemical Properties of Soil Organic Matter, by B. A. Keen of the Rothamsted Experiment Station, England; Organic Matter Supplied in Crop Residues, by E. E. DeTurk; Organic Matter Requirements of Soil Under Various Climatic Conditions, by J. C. Russell; Soil Organic Matter and Manurial Treatments, by J. W. White; and The Chemical Composition of Organic Matter as Related to Its Effectiveness, by F. J. Salter.

In the farm crops section dealing with crop rotation W. W. Weir led a symposium which included papers on Crop Rotation in Relation to Soil Productivity, by T. C. Johnson; Crop Sequence, a Principle of Rotation, by F. E. Bear; Legumes and Grasses in Crop Rotation, by T. L. Lyon; Rotation in Relation to the Agriculture in the Corn Belt, by A. T. Wiancko; Crop Rotation in the Great Plains Area, by H. L. Walster; and Crop Rotation in Relation to Southern Agriculture, by M. J. Funchess. A plant breeding symposium led by H. K. Hayes embraced papers on The Relation of Triploid Factors and Chromosome Groups in Wheat and Oats, by E. F. Gaines; Breeding Wheat for Resistance to Physiologic Forms of Black Stem Rust, by O. S. Aamodt; Breeding Improved Varieties of Forage Crops, by L. E. Kirk; and Accurate Determination of Dry Matter in Forage Crops, by G. P. McRostie.

The usual reports were received from the editor, the secretary-treasurer, and the several committees of the society, and B. L. Hartwell, H. H. Love, C. A. Mooers, E. Truog, and C. G. Williams were elected fellows.

Officers were elected as follows: President, W. L. Burlison; vice presidents, M. J. Funchess, E. F. Gaines, A. G. McCall, and W. W. Burr; members of the advisory committee to the National Research Council, J. G. Lipman and R. W. Thatcher; and representatives to the American Association for the Advancement of Science, R. J. Garber and C. E. Leighty.

EXPERIMENT STATION RECORD

VOL. 55 DECEMBER ABSTRACT NUMBER No. 9

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Lectures on food chemistry and related topics [trans. title] (*Mitt. Lebensmtl. Untersuch. u. Hyg., Eidg. Gsndhtsamt.* [*Switz.*], *17* (*1926*), *No. 3–4, pp. 101–221, figs. 17*).—This series of summaries of present knowledge in various subjects having a bearing on food chemistry includes among others the following papers: The Determination of Hydrogen-Ion Concentration and Its Application to Food Chemistry, by J. Abelin (pp. 112–124); Serological Studies of Foods, by Sobernheim (pp. 125–132); Physicochemical Determinations by Accelerated Precipitation, by M. Duboux (pp. 133–140); The Present State of the Vitamin Question, by R. Burri (pp. 140–151); Methods for the Detection of Vitamins, by O. Stiner (pp. 152–159); Microchemistry and Its Relation to the Examination of Foods, by E. Elser (pp. 192–206); and The Technique of Microphotography, by Staub (pp. 207–221).

Textbook of physiological chemistry, O. HAMMARSTEN, S. G. HEDIN, J. E. JOHANSSON, and T. THUNBERG (*Lehrbuch der Physiologischen Chemie. Munich: J. F. Bergmann, 1926, 11. ed., rev., pp. VIII+835, pl. 1, figs. 2*).—A revision of this well-known textbook, the English translation of an earlier edition of which has been noted previously (E. S. R., 26, p. 201).

The iso-electric points of various proteins, F. A. CSONKA, J. C. MURPHY, and D. B. JONES (*Jour. Amer. Chem. Soc., 48* (*1926*), *No. 3, pp. 763–768*).—In this study of the isoelectric points of the various vegetable proteins used in previous studies at the Bureau of Chemistry, U. S. D. A. (E. S. R., 52, p. 802), the method employed consisted in shaking buffer solutions having a pH range of from 4 to 6.8 with an excess of the protein, precipitating the dissolved protein in the clear filtrate with tungstic acid, and comparing the resulting turbidities. The Sörensen value of the buffer in which was produced the least turbidity was taken as the isoelectric point of the protein.

The values obtained assembled as albumins, globulins, prolamines, and miscellaneous show a striking agreement for the various representatives of a single group. The values for albumins ranged from pH 4 to 5, globulins 5 to 5.5, and prolamines from 6 to 6.5. The β-globulins had lower isoelectric points than the α-globulins. The albumins were more soluble in the buffer solutions used on the alkaline side of their isoelectric points and the globulins on the acid side.

Preparation and colloidal properties of pectin.—Preliminary report, M. A. GRIGGS and R. JOHNSTIN (*Indus. and Engin. Chem., 18* (*1926*), *No. 6, pp. 623–625*).—The authors describe in detail their method of preparing a pectin of high purity, discuss some of the colloidal properties of the pectin, and

indicate lines of investigation which they propose to follow in a further study of the colloidal properties of pure pectins.

The successive steps in the technique for the preparation of pure pectin from lemon albedo are essentially preliminary soaking of the albedo in alcohol for about 10 minutes to harden the skin and prevent darkening during the next step, grinding in a meat chopper; rapid extraction of organic impurities from the ground albedo by alcohol and then by ether under a reflux condenser until the extracts are colorless; drying of the residue at a temperature not higher than 65° C.; extraction of the pectin from 15-gm. amounts of the residue by successive additions of 750, 500, and 500 cc. of N/100 HCl at 90° (the first portion being added cold and stirred for 15 minutes before heating to 90°); removal of inorganic impurities from the pectin sol by dialysis in a parchment bag with N/100 HCl, using a fresh portion of the acid daily until it no longer gives a test for calcium, and finally dialyzing out the acid with distilled water; precipitation of the pectin from dilute solution (1 gm. in 300 or 400 cc.) by adding two volumes of 95 per cent alcohol dropwise at room temperature, with constant stirring; and flocculation of the gelatinous precipitate by hydrolysis and filtration with suction through silk.

The pectin thus prepared is said to be a snow-white hard powder containing about 11 per cent moisture and 0.18 per cent ash. Its specific rotation is +230 at 23°. A preliminary study of the viscosity at 25° of pectin sols of different concentrations gave values increasing from 1.348 for a concentration of 0.1 per cent to 7.235 for 1 per cent. It is considered that heat and evaporation play no important part in pectin gel formation, but that the important factors are the degree of dispersion of the pectin and the time required for the building up of the gel structure.

Pectic acids, E. K. NELSON (*Jour. Amer. Chem. Soc., 48 (1926), No. 9, pp. 2412–2414*).—Evidence is presented that the pectic acid obtained by the Wichmann and Chernoff method for determining pectin in fruit products (E. S. R., 51, p. 205) is identical with the insoluble digalacturonic acid of Ehrlich and Sommerfeld (E. S. R., 55, p. 407).

Furfural and its derivatives (*Miner Labs., Furfural Dept. [Chicago] Bul. 2 (1925), pp. [2]+53*).—A comprehensive review of the literature on furfural—its preparation, physical and chemical properties, methods of analysis, derivatives, and technical uses. A bibliography of 777 titles and a table of the physical properties of some furfural derivatives are appended.

The solubility of vitamin B in benzene, R. R. WILLIAMS and R. E. WATERMAN (*Jour. Biol. Chem., 68 (1926), No. 3, pp. 499–501*).—The experiments of McCollum and Simmonds leading to the conclusion that under certain conditions vitamin B is soluble in benzene (E. S. R., 38, p. 612) have been repeated, with the conclusion that pure benzene is incapable of dissolving the vitamin, but that it does remove it from alcoholic extracts containing small amounts of water and alcohol.

The cotton seed and its products, D. WESSON (*Indus. and Engin. Chem., 18 (1926), No. 9, pp. 938–940, figs. 4*).—A brief description is given of the improvements in the past 25 years in the milling of cotton seed, the refining of cottonseed oil, and the further treatment of the refined or deodorized oil. In the opinion of the author, future improvements in the cottonseed oil industry will lie in the utilization of cottonseed protein meal as human food.

Chemistry of wood, VIII, IX, G. J. RITTER and L. C. FLECK (*Indus. and Engin. Chem., 18 (1926), No. 6, pp. 576, 577, 608, 609*).—Two papers are presented in continuation of the series previously noted (E. S. R., 51, p. 311).

VIII. *Further studies of sapwood and heartwood.*—Data are reported confirming the statement in the sixth paper of the series (E. S. R., 50, p. 712) that softwoods can be distinguished from hardwoods by the relatively larger amounts of extractives and smaller amounts of cellulose and lignin in the heartwood than in the sapwood. An exception to this is white spruce, in which the cellulose-lignin content is approximately the same in both sapwood and heartwood. The earlier statement that hardwoods can be divided into two groups distinguished by a high content of extractives in the sapwood and heartwood, respectively, was also confirmed. On this basis the first group includes white ash, pignut hickory, red alder, red mulberry, sugar maple, and catalpa; and the second, yellow poplar, yellow birch, white oak, red oak, locust, and eucalyptus.

IX. *Springwood and summerwood.*—Data obtained by methods employed in previous studies of the series are reported on the chemical composition of springwood and summerwood of six representative species of wood. The principal differences were a higher percentage of lignin and a lower of cellulose in the springwood than the summerwood.

Apparatus for wet ashing, W. A. Turner (*Indus. and Engin. Chem., 18 (1926), No. 6, p. 630, figs. 3*).—The apparatus described, which was devised at the Bureau of Dairying, U. S. D. A., to prevent the escape of sulfuric acid and nitric oxide fumes in the wet ashing of organic compounds, consists of a tube similar to the lead tube usually employed in Kjeldahl determinations except that it is made of acid-resistant Duriron and has additional openings at the top for the introduction of nitric acid into each flask from a dropping funnel supported on a heavy glass rod to avoid the use of corrosive metals. A burner rack similar to that used for Kjeldahl determinations supports the 500-cc. long-necked Kjeldahl flasks used for the ashing. There is an opening at the end of the Duriron tube for the escape of the condensed moisture. The apparatus is installed in a hood and is provided with a special fan in the Duriron tube leading to a flue.

Analysis of lime, J. C. Bailar (*Indus. and Engin. Chem., 18 (1926), No. 4, pp. 389, 390*).—Three methods of determining calcium oxide in the presence of calcium carbonate are outlined. These are titration with a solution of iodine in potassium iodide solution, titration with a solution of zinc chloride, and a sucrose method in which the hydrated lime is dissolved in sugar solution of known strength and titrated with standard nitric acid. The success of any of these methods is thought to depend largely upon complete hydration of the lime. The sucrose method is the most time-consuming and the iodine method the most expensive of the three.

The determination of calcium by the conversion of the oxalate to the carbonate, H. W. Foote and W. M. Bradley (*Jour. Amer. Chem. Soc., 48 (1926), No. 3, pp. 676–678*).—"Calcium may be determined accurately as the carbonate by igniting the oxalate in a current of carbon dioxide under suitable temperature control. The method gives results as good as or better than the method depending on the conversion of the oxalate to oxide. It has the advantages over the oxide method that the carbonate can be weighed without danger of taking up moisture or carbon dioxide, and the precipitate of oxalate can be filtered in a porcelain Gooch crucible, thereby saving time in filtration and avoiding the use of a platinum crucible for ignition. On account of the accuracy and speed of the method, the writers believe that it may often be substituted to advantage for the rapid method of determining calcium by titrating the oxalate with permanganate."

Iodometric determination of the halogens, P. L. HIBBARD (*Indus. and Engin. Chem., 18 (1926), No. 8, pp. 836–838, fig. 1*).—In the method described, the manner of preparing the solution for analysis, the apparatus and reagents, and the technique for the determination of bromine are the same as in a previous paper (E. S. R., 55, p. 111). In the present method, iodine, bromine, and chlorine are set free in the order given by ferric sulfate, chromic anhydride, and potassium permanganate with sulfuric acid, respectively. In each case the liberated halogen is absorbed in potassium iodide and titrated with sodium thiosulfate. The method is said to be applicable to mixtures containing from 0.1 to 10 mg. of iodine, chlorine, or bromine and to have an accuracy of ±5 per cent on amounts more than 1 mg.

New reagent and standard for borax, LeR. S. WEATHERBY and H. H. CHESNY (*Indus. and Engin. Chem., 18 (1926), No. 8, pp. 820, 821*).—A study of glycerol, glucose, levulose, honey, and invert sugar as possible substitutes for the much more expensive mannitol in the determination of borax is reported, with the conclusion that commercial glucose, Cerelose, is a satisfactory substitute for mannitol. It was found possible to obtain fairly accurate results with honey and levulose, but their use is not recommended, as the accuracy of the results depends upon the concentration of the added reagent, which is not the case with glucose. Glycerol and invert sugar were less satisfactory than mannitol or glucose. In the titration of borax in the presence of other alkaline salts, the alkalinity of the other salts introduces an error which can be eliminated by the establishment of color standards for known mixtures of borax with these salts.

A new micro method for determining carbon in organic compounds, H. L. LOCHTE (*Jour. Amer. Chem. Soc., 48 (1926), No. 5, pp. 1301–1305*).—In this micro modification of the method previously described (E. S. R., 53, p. 805), a 180 by 30 mm. Monel-metal bomb is used in place of a steel bomb. A 200 by 30 mm. Pyrex test tube cut to the proper length serves as a temporary lining and is used directly for the titration, thus obviating rinsing. In place of a shaking apparatus an adjustable rotating machine is used. This is set at such an angle that as the bomb is rotated at 100 revolutions per minute about 75 per cent of the inner surface of the test tube is exposed to the absorbing liquid. If carbon alone is to be determined, a saturated solution of barium hydroxide is used as the absorbing medium. The technique of the procedure for the micro analysis of solids and liquids is described, with typical data obtained in the analyses of various compounds. Nitrogen and sulfur were found not to interfere with the use of this method, but the bomb is corroded by compounds containing chlorine. The complete determination is said to require from 50 to 60 minutes.

Determination of moisture in meat extract, C. DEDLOW and D. T. SMITH (*Indus. and Engin. Chem., 18 (1926), No. 8, pp. 858–860, figs. 6*).—A study of various methods of determining moisture in meat extract having demonstrated that the usual methods give values from 2 to 6 per cent too high owing to progressive decomposition of the extract, a vacuum distillation method has been devised in which the distillation is conducted at a temperature so low that no decomposition of the extract as measured by the liberation of ammonia can be detected. The method consists in distilling off the water with xylene under an absolute pressure of only 30 to 50 mm. of mercury in an apparatus similar to that described by Bidwell and Sterling (E. S. R., 53, p. 805). Iced brine is used in the condenser to avoid the loss of water. At a temperature of 50° C. about 2 hours is required to complete the removal of the moisture.

Determination of moisture in wheat and flour, Part IV, H. SNYDER and B. SULLIVAN (*Indus. and Engin. Chem., 18 (1926), No. 3, pp. 272-275, fig. 1*).—A comparison of the vacuum oven, nitrogen, and hydrogen drying methods of determining the moisture content of wheat and flour is reported in this continuation of the studies previously noted (E. S. R., 53, p. 807).

The average moisture content of 58 samples of flour was 13.95 per cent by hydrogen drying as compared with 13.46 per cent by drying in a vacuum oven at 100° C. and 600 mm. of vacuum. The results with nitrogen and preheated air were practically the same as with hydrogen. In the various methods the dryness of the gas was found to be of essential importance.

"As an industrial problem the determination of moisture in flour for manufacturing or other control purposes is largely a matter of using and strictly adhering to empirical conditions as to temperature, time, and manipulation. Such methods are not necessarily suitable for research work, because flour is a complex mechanical mixture of various carbohydrates, proteins, and other compounds, which are appreciably affected by heat. Hence any moisture method thus far developed is a relative rather than an absolute expression as to moisture content."

The chemistry and examination of edible oils and fats, their substitutes and adulterants, G. D. ELSDON (*London: Ernest Benn, 1926, pp. XIX+521, pls. 3 figs. 10*).—The first 9 chapters of this exhaustive reference book deal with the general characteristics of fats and oils and their components and with qualitative and quantitative physical and chemical tests. In the remaining 22 chapters edible fats and oils are discussed from the standpoint of source, composition, properties and special tests, and examination for adulteration. In the order of treatment the classification of Lewkowitsch is followed. Extensive references to the original literature are given throughout the text, and the most recent literature is noted in an appendix. In addition to the customary author and subject indexes a botanical index is included.

A method for the direct identification of rapeseed oil by isolation of erucic acid, A. W. THOMAS and M. MATTIKOW (*Jour. Amer. Chem. Soc., 48 (1926), No. 4, pp. 968-981, fig. 1*).—The observation that when the magnesium soaps of rapeseed oil are precipitated and decomposed a fatty acid results, the constants of which approximate those of erucic acid (E. S. R., 48, p. 711), has been developed into a method for determining the purity of rapeseed oil and for detecting the adulteration of olive and cottonseed oils with rapeseed oil. The method consists briefly in the separation of magnesium erucate along with small amounts of the saturated soaps present in 90 per cent alcohol and the subsequent isolation of erucic acid from which behenic acid is obtained by hydrogenation in the presence of a catalyst.

The determiation of pectin: Titration method, C. F. AHMANN and H. D. HOOKER (*Indus. and Engin. Chem., 18 (1926), No. 4, pp. 412-414, figs. 2*).—Essentially noted from another source (E. S. R., 54, p. 207).

The estimation of sugar in blood and normal urine, S. R. BENEDICT (*Jour. Biol. Chem., 68 (1926), No. 3, pp. 759-767*).—This paper includes a reply to the criticisms of Folin (E. S. R., 55, p. 613) concerning the author's recent method of determining blood sugar (E. S. R., 54, p. 10), and the description of certain modifications in the technique of this method which have been introduced for speed and convenience. These include the addition of an ammonium salt to the copper reagent to hold the reduced copper in solution and thus bring about immediate color development after the addition of the color reagent, and slight changes in the composition of the complex tungstic acid color reagent and the copper reagent.

Purification of diffusion juice from beets, H. SCHREIBER (*Indus. and Engin. Chem., 18 (1926), No. 8, pp. 860–864*).—Experiments during the beet-sugar seasons of 1924 and 1925–1926 are reported, indicating that the treatment of beet diffusion juice with pepsin or rennin followed by treatment with from one-fourth to one-sixth the usual amount of lime gives a much better purification than the usual process employing only lime and at a total estimated saving of from 40 to 50 cts. per ton of beets. "Furthermore, the sirup produced from beets by pepsin and lime purification is edible, has an agreeable odor and taste, much better even than cane sirup, which means that an edible sirup and brown sugar can be produced by this process."

Vinegar: Its manufacture and examination, C. A. MITCHELL (*London: Charles Griffin & Co., 1926, 2. ed., rev., pp. XVI+211, [pls. 4], figs. [50]*).—A revision of the volume previously noted (E. S. R., 37, p. 112), with three additional appendixes dealing, respectively, with acetic bacteria, synthetic acetic acid, and the detection of metals in vinegar.

METEOROLOGY

Agricultural meteorology and the forecasting of crops [trans. title], L. CHAPTAL (*Assoc. Franç. Avanc. Sci. Confs., Compt. Rend., 48 (1924), pp. 1032–1038*).—This article discusses briefly the determination of critical periods, relations between weather and crops, and coefficients of correlation and regression equations.

The author attaches less value to correlation coefficients as a basis for predicting crop yields than to a method which he describes, based on estimates of damage due to unfavorable weather and other causes, involving the factors of the maximum crop possible in a given place, and estimates of the probable damage. The stated advantages of this method are that (1) it is applicable to all crops, (2) it takes account of all factors affecting crop yield, and (3) it gives both yields and losses.

Solar and terrestrial relationships (*Paris: Étienne Chiron, 1926, pp. 202*).—This report (in English and French) of a committee of the International Research Council, appointed in 1924, gives a survey of the present knowledge on this subject and discusses the outlook for further research, with a bibliography of 100 references to the literature.

The report states that solar changes are definitely known to affect the magnetic condition of the earth and earth currents, auroras, and meteorological and climatic changes, and that "the principal variable solar phenomena which can be definitely asserted to affect terrestrial conditions are as follows: The general radiation of the sun; local disturbance on the sun, as manifested by sun spots, faculae, and prominences; the general march of the solar cycle." Various other probable effects and phenomena of solar changes are enumerated. It is stated that "several significant correlations have been established between mean sun spot numbers and terrestrial temperature, rainfall, and barometric pressure. The existing supply of meteorological data probably suffices for the further investigation of such relationships, but there is great need for more solar data. The regular detailed observation of (a) the amount and spectral distribution of the total solar radiation, and (b) of the absorption of solar radiation in the earth's atmosphere, is of primary importance."

Sunspots and Australian rainfall, E. T. QUAYLE (*Roy. Soc. Victoria, Proc., n. ser., 37 (1925), No. 2, pp. 131–143, figs. 5*).—Grouping and mapping the percentage rainfall departures from normal at various stations in the country during the three chief phases of solar activity, it appears evident that "from the

first to the fourth year, when the sun-spottedness is usually at its maximum, the rainfall is rising to its maximum. Then the rainfall begins to decline, not regularly, but so as to reveal drought tendencies every third year, or in the sixth, ninth, and twelfth years of the sun-spot cycle, the last being much the worst."

Some periods in Australian weather, E. KIDSON (*Aust. Bur. Met. Bul. 17 (1925), pp. 3–33, figs. 14*).—A close relationship is shown between the annual latitude range of anticyclones and the Wolfer sun spot numbers. The anticyclones appear to have a slightly greater relief with high than with low spot numbers. The relation between rainfall and sun spots was found to be very complicated and very different in different parts of the Commonwealth.

The yearly course of temperature in temperate zones and periods of plant growth [trans. title], W. KÖPPEN (*Met. Ztschr. [Brunswick], 43 (1926), No. 5, pp. 161–172, figs. 3*).—The course of temperature and of the growth of various wild and cultivated trees and other plants at widely separated places is reviewed.

Meteorological tables, D. A. SEELEY (*Mich. State Bd. Agr. Ann. Rpt. Sec., 64 (1925), pp. 119–131*).—Daily and monthly summaries of temperature, precipitation, cloudiness, and sunshine, and monthly summaries of pressure, wind movement, and miscellaneous phenomena (frost, hail, thunderstorms, fog, auroras, and halos, at Lansing, Mich., are given for the year ended June 30, 1925.

Meteorological observations in Assam, 1925, C. R. HARLER (*Indian Tea Assoc., Sci. Dept. Quart. Jour., 1926, No. 1, pp. 31–41, pl. 1*).—Observations at Tocklai, on temperature of the air and soil, sunshine, precipitation, and wind, are reported and discussed in their relation to the tea crop.

The importance of the early rains of March and April, which promote the spring flush, and of the time of retreat of the monsoon in autumn, which is followed by a decrease in humidity and fall of temperature which check production of salable leaves, is emphasized. These are considered to be "the deciding factors in tea crop production in northeast India, and at present neither of these events can be predicted far ahead with certainty." The fact that good early tea crops are generally followed by normal or poor late crops is ascribed to exhaustion of the crop-producing capacity of the soil by the early crop.

Observations of the German Phenological Service for the year 1923 [trans. title], E. WERTH (*Mitt. Biol. Reichsanst. Land u. Forstw. No. 27 (1926), pp. 7–212*).—Observations on the course of development and enemies and diseases of cultivated plants and on general phenological phenomena are recorded in detail for 1923, in continuation of those previously noted (E. S. R., 55, p. 16).

Drought in the Volga district [trans. title], N. M. TOULAIKOFF (*Matér. Étude Calamités, 2 (1926), No. 8, pp. 308–338; abs. in Nature [London], 118 (1926), No. 2958, p. 63*).—Reviewing the results of a study of conditions in this region of the Union of Socialistic Soviet Republics, it is stated that as a whole the soils are naturally fertile and that the size of the crops is determined by the distribution of the scanty rainfall, which averages less than 16 in. annually. That is, while poor crops generally occur in years of deficient total rainfall, there have been instances of abundant crops in years of scanty but well distributed rainfall. "If it were possible to take advantage of all the natural factors which go to make up the local climate—especially the snowfall in winter—there would be enough moisture, given also modern and rational methods of agriculture, to insure a regular succession of crops. . . . The prob-

lem, therefore, appears to be to adapt agriculture to the particular nature of the climate."

The main crop, summer wheat, suffers especially from deficient rainfall in May and June. Rye is less affected by drought at this time. The more extensive culture of this crop and of other crops, such as corn, millet, sorgo, beets, and sunflowers, more resistant to prolonged drought, is suggested. Other ways in which the situation may be improved are pointed out.

SOILS—FERTILIZERS

[Soil studies at the Michigan Station], M. M. McCool et al. (*Michigan Sta. Rpt. 1925, pp. 233–236*).—Laboratory investigations by C. H. Spurway are reported to have shown that the presence of calcium carbonate, the quantity of hydrolyzing bases such as potassium, sodium, calcium, and magnesium, the presence of iron and aluminum hydroxides, adsorption, and reaction appear to be active in the fixation of phosphorus by soils. Of the hydrolyzing bases calcium and magnesium tend to cause phosphorus reversion in soils, while sodium and potassium tend to keep the applied phosphorus more soluble. Neutral salts appear to have a marked residual effect on the soil reaction. Calcium salts cause little difference in reaction, while magnesium salts tend to make it more alkaline, and sodium and potassium salts change it toward or above the neutral point.

Data on soil fertility investigations are also included.

Activities of the Institute of Soils and Plant Nutrition [trans. title], Densch (*Landw. Jahrb., 60 (1924), No. 2, pp. 130–146*).—A large amount of data is reported from laboratory studies of soils, field experiments on the use of nitrogenous, phosphatic, and potassic fertilizers, and field and garden experiments on the use of commercial fertilizers, fertilizer materials, and stable manure on different crops, and on the influence of different physical properties of soil on crop growth.

The mechanical analysis of soils: A report on the present position and recommendations for a new official method (*Jour. Agr. Sci. [England], 16 (1926), No. 1, pp. 123–144*).—This is a report of the subcommittee of the Agricultural Education Association on the present position with regard to the mechanical analysis of soils. Recommendations for future practice in this respect are made.

Soil survey of Adams County, Pennsylvania, A. L. Patrick and H. H. Bennett (*Penn. Topog. and Geol. Survey Bul. C 1, pt. 3 (1924), pp. 44, pl. 1*).—This survey made in cooperation with the U. S. D. A. Bureau of Soils, apparently supersedes a previous survey made by the Bureau in 1904 (E. S. R., 17, p. 740). The county covers an area of 337,920 acres. The soils of the uplands are of residual origin. Twenty-three soil types of 19 series are mapped, of which the Penn and Montalto silt loams cover 27.4 and 10.1 per cent of the area, respectively.

Studies on the formation of the Rendzina soils [trans. title], Z. Starzyński (*Pam. Państ. Inst. Nauk. Gosp. Wiejsk. Puławach (Mém. Inst. Natl. Polon. Écon. Rurale Puławy), 4 (1923), A, pp. 244–301, figs. 4*).—A survey of the physical, mineralogical, and chemical characteristics of the so-called Rendzina soils in an area situated between the Vistula and Bug Rivers is presented. The results indicate that the Rendzina soils owe their origin to calcareous materials, and therefore possess characteristics adequate for the complete activity of these materials. An English abstract is included (pp. 295–299).

Possibilities for the commercial utilization of peat, W. W. Odell and O. P. Hood (*U. S. Dept. Com., Bur. Mines Bul. 253 (1926), pp. VII+160, pls. 6, figs. 23*).—This report indicates that workable peat deposits of various grades under

widely varying conditions cover a large area of the United States. Peat is seldom the same from the top to the bottom of any peat deposit. It is usually stratified, the more mature peat occurring at the lower levels. It is concluded that the general utilization of peat resources will depend upon the finding of numerous industrial uses.

It was found that the calorific value of a given weight of peat can not be increased by any change in the method of winning, by briquetting, or by any other mechanical process. Peat char has a greater calorific value than that of an equal weight of peat, but the calorific value of peat char made from a unit weight of peat is equal to about 60 per cent of that of the latter. The calorific value of air-dried peat fuel is approximately 6,750 B. t. u. per pound. Such fuel is therefore classed in general as a low grade fuel and can not be considered even approximately the same as good coal.

Attention is drawn to the fact that although some peats contain a relatively high percentage of nitrogen, peat is not a nitrogenous fertilizer owing to the insolubility of its nitrogen content. On the other hand, its value as a soil conditioner, owing to its high content of organic matter, is emphasized.

The evaporation of water from soil.—III, A critical study of the technique, B. A. Keen, E. M. Crowther, and J. R. H. Coutts (*Jour. Agr. Sci. [England], 16 (1926), No. 1, pp. 105–122, figs. 5*).—In a third contribution to the subject from the Rothamsted Experimental Station (E. S. R., 50, p. 812), studies on the evaporation of water from soil are reviewed.

Experiments on the evaporation of water from a soil paste spread in shallow pans showed that the drying proceeded very irregularly over the soil mass. Considerable portions became almost completely dry, while other portions remained very wet. There was a rough relationship between the form of the dry patch and the shape of the corresponding evaporation rate curves.

An improvement in technique was effected by exposing the soil in thin layers below glass plates. Reproducible results were obtained under these conditions. Soil and kaolin, but not sand, gave considerable linear portions over the region of decreasing rate of evaporation. Tests of soil exposed as central disks or peripheral rings and on partially covered full plates showed that, owing to the type of air currents set up, the drying was largely confined to the outer edges during the early stages.

The establishment of a moisture gradient in this way was subsequently opposed by the lateral movement of water by capillarity. By interposing a barrier to the lateral spread of the air currents, the rate of evaporation was reduced to one-fourth and the resulting curves approximated the limiting case of slow evaporation.

The results are taken to indicate that the evaporation of water is controlled by two groups of factors depending on the soil-water relationships and the environmental conditions. The latter group includes such factors as diffusion of water vapor from the soil to the acid, and bulk air movements set up by (1) the temperature gradient from bottom to top of the evaporating chamber, (2) the cooling of the soil by evaporation, (3) inevitable disturbances in the weighings, and (4) the lower density of moist air. Thus the environmental conditions are very complex and liable to irregular changes from one experiment to another. Differences in the rate curves for various materials can not, therefore, be attributed solely to the water relationships of the material. "Where the results are obtained by a carefully controlled and reproducible technique certain comparisons can be made, but caution must be exercised at present in associating precise physical explanations with the shape of the complete rate curves."

The relations between certain soil moisture constants and the determination of the vesicular coefficients of soils, C. H. WRIGHT (*Jour. Agr. Sci. [England], 16 (1926), No. 1, pp. 18–23*).—Studies conducted by the Agricultural Department, Nigeria, are reported which indicate that the free water in a soil corresponds to the constant 21 in the Briggs-Shantz equation. Wilsdon's modification of the Briggs-Shantz equation is discussed. This equation, $M=xH+21$, in which M is the maximum water-retaining capacity, x is the vesicular coefficient, and H is the hygroscopic coefficient, permits the establishment of the vesicular coefficient of any soil.

The values thus obtained for clay soils agreed with those found by Hardy's method from the moisture at the point of maximum plasticity. The vesicular coefficient of a soil was also found to be greater than that of its subsoil. The vesicular water expressed as a percentage of the plastic soil was found to be equal to the cubical shrinkage coefficient.

The effect of fallowing on soil moisture, R. D. LEES (*Agr. Gaz. N. S. Wales, 37 (1926), No. 2, pp. 109, 110*).—The results of studies are briefly summarized which indicate that fallowing will conserve an amount of moisture equivalent to at least 4.5 in. of rain in a normal season, and is essential under the climatic conditions of the Australian wheat belt. A good seed bed is produced, which, together with the additional moisture, promotes satisfactory germination. It is estimated that every inch of rain stored by fallowing is capable of producing 3.5 bu. of wheat.

A study of some of the factors affecting the supply of moisture to crops in sandy soils, H. W. STEWART (*Soil Sci., 21 (1926), No. 3, pp. 197–223, figs. 15*).—Studies, conducted at the Wisconsin Experiment Station, are reported of the moisture relationships of sand, fine sand, and sandy loam soils, all having a low organic matter content, in order to determine to what degree their moisture content under varying seasonal distribution of rainfall becomes a limiting factor in crop production. The crops were corn, oats, clover, rye, and soy beans, and more than 1,200 moisture determinations were made.

The oats crop was found not adapted to these sandy soils. It was found possible to produce corn for silage on the three classes of soil, but when it is grown for grain it should be confined to sandy loam. Rye was the small grain crop best adapted to these soils. As a forage crop soy beans yielded well on all three soils, the most profitable yields of seed being grown on sandy loam.

The penetration of moisture on cultivated corn soils 24 hours after a 0.58-in. rain was into the 12- to 18-in. depth of medium sand, but was almost wholly confined to the 6-in. depths of fine sand and sandy loam. Eight days after the rain its effect in the medium and fine sands disappeared, but was evident at the 18- to 30-in. depth of sandy loam.

Medium sand supplied crops with more moisture from light rains and showers than did fine sand or sandy loam when the precipitation came at a time when the initial moisture content of the soils was low. The greater water-holding capacity of sandy loam enabled it to store a sufficient supply from the heavier rains to produce the largest yields under the type of seasons during this investigation.

The difference between the productive capacities of medium and fine sand, as determined by their ability to meet the water requirements of crops over periods of from 2 to 7 years, was found to be negligible, and suggested the feasibility of grouping them together in any system of classification in which productiveness is considered an essential factor.

Removal of plant nutrients in drainage waters, J. A. Bizzell (*Jour. Amer. Soc. Agron., 18 (1926), No. 2, pp. 130–136*).—The results of studies conducted at the New York Cornell Experiment Station are briefly summarized, indicating that large quantities of calcium are removed from soil by drainage waters. Calcium is the predominant constituent, generally amounting to more than all the other nutrients together. The effect of cropping is to decrease the amount leached. Applications of ammonium salts, especially ammonium sulfate, were found to increase markedly the calcium losses.

The quantities of magnesium and potassium removed by drainage water were found to be appreciable but not excessive. Nitrogen appeared in drainage waters almost entirely as nitrates, and the general effect of cropping is to reduce the amount lost. The loss from soil growing legumes appeared to be greater than from soil growing nonlegumes. The amount of sulfur removed by drainage was found to be comparatively large, but the amount of phosphorus removed was practically negligible.

Colloidal behavior of soils and soil fertility.—II, The soil complex capable of base exchange and soil acidity, J. S. Joffe and H. C. McLean (*Soil Sci., 21 (1926), No. 3, pp. 181–195, figs. 3*).—In a second contribution to the subject from the New Jersey Experiment Stations (E. S. R., 54, p. 417), the colloid fraction of soils is analyzed and discussed, and the problem of soil acidity is reduced to the question of state of saturation and unsaturation of the soil complex capable of base exchange.

Experiments to determine quantitatively the amount of H ions present in the soil complex showed that this procedure adds but little to the knowledge of the state of saturation or unsaturation in a water extract of soil and gives an idea only of the free acid present.

It was found that the speed of cation replacement is linked with the colloidal nature of the soils investigated. Data presented show the effect of concentration of replaceable cations on the speed of replacement in the colloid fraction of the soil. Temperature effects were found to bring about a coagulation of the colloids and thus a slowing down of the replacement reactions.

Time rate data show that replacement is speeded up by longer contact within certain limits. The time rate curves point toward the colloidality of the soils, and corroborate the determinations made on the colloidality of the soil by the suction force method.

Soda formation in soils [trans. title], J. Zink (*Ztschr. Pflanzenernähr. u. Düngung, 6 (1926), No. 4, Wiss., pp. 229–237*).—Studies on the manner in which sodium alkalies are formed in soils are briefly reported, together with a review of the work of others bearing on the subject.

The results indicated that alkali bicarbonates originate from the reaction of calcium bicarbonates with the mineral acids of alkali salts. When a solution of alkali bicarbonates is evaporated at ordinary temperatures, carbon dioxide escapes and a mixture of alkali carbonates and bicarbonates remains. This occurs especially in soil. When the solution contains gypsum also, only those alkali bicarbonate quantities remain which are in excess of the gypsum present.

It is concluded that, under natural conditions, neither the reaction of simple calcium carbonate with alkali salts nor the hydrolytic alkalinity due to calcium carbonate will result in alkali conditions injurious to soil or plant.

Climate and soil in their effect on plant life, H. Lundegårdh (*Klima und Boden in Ihrer Wirkung auf das Pflanzenleben. Jena: Gustav Fischer, 1925, pp. VIII+419, pls. 2, figs. 113*).—A series of lectures on the subject is presented in book form. Chapters are included on the light, temperature, and water

factors, the formation and general ecological properties of soil, the carbon dioxide factor, and the guiding principles of ecological research.

Changes in character, condition, and amount of soil organic matter, O. Schreiner (*Jour. Amer. Soc. Agron., 18 (1926), No. 2, pp. 115–126, fig. 1*).—Studies conducted by the U. S. D. A. Bureau of Plant Industry are briefly summarized, the results of which are taken to indicate the impossibility of explaining the deterioration of soil organic matter as a result of human occupation of the land by existing data derived from analytical chemical methods. The opinion is expressed that soil organic research is fundamental in this connection.

[Soil bacteriological studies at the Michigan Station], R. M. Snyder (*Michigan Sta. Rpt. 1925, p. 192*).—It is reported that oats has not proved as well adapted for the biological decomposition of peat as has buckwheat.

Laboratory studies on the action of various organisms in peat decomposition have indicated the possibility of preparing peat-agar plates resembling cellulose-agar plates. Selenium oxychloride is used as a peptizing agent.

Studies with plant materials have led to the belief that their biological reactions are not greatly influenced on being peptized with this reagent.

The bacterial types occurring in frozen soil, A. G. Lochhead (*Soil Sci., 21 (1926), No. 3, pp. 225–231*).—Studies conducted at the Central Experimental Farm, Ottawa, of the bacterial types in field soil which had been frozen for more than two months are reported. Apart from Actinomycetes, which did not develop at the low temperature, the number of colonies appearing at 3° C. was less than 10 per cent of those occurring at 20°, most of the bacteria of frozen soil being incapable of low temperature growth.

At 20° the most abundant type was the group of nonsporulating short rods, nonliquefying or slowly liquefying, and the next most abundant group was that of Actinomycetes. Rapidly liquefying rods and micrococci were found to be numerically unimportant. At 3° the nonliquefying or slowly liquefying short rods formed a higher proportion of the bacterial colonies. The other groups showed even less capability for low temperature growth than these forms.

The microflora of frozen soils did not appear to exhibit characteristics different from that of other seasons. Sixteen type species isolated from nutrient agar plates at 3° are described, as well as their approximate frequency. Two types were found to predominate, both being nonsporulating short rods, one slowly liquefying and one nonliquefying. Both appeared to be representative soil types of other seasons, which develop better at moderate temperatures.

Humification of the dead covering of forest soils [trans. title], A. Němec (*Compt. Rend. Acad. Sci. [Paris], 182 (1926), No. 9, pp. 590–592*).—Studies are reported which showed that the proportion of humified material contained in the organic matter covering of forest soils increased with decreasing acidity. Strongly acid humus from under conifer forests was deficient in humified matter and in nitric nitrogen. Leaf humus was in general less acid, more humified, and more susceptible to nitrification. The acid humus from conifer forests became more easily soluble after exposure to the direct action of the sun's rays.

The relation of the soil nitrogen to nodule development and fixation of nitrogen by certain legumes, G. Gröbel (*New Jersey Stas. Bul. 436 (1926), pp. 3–125, figs. 22*).—The results of pot experiments with alfalfa demonstrated conclusively that infection and the establishment of the process of nitrogen fixation proceed best in plants well supplied with combined nitrogen during their early stages of growth. This appeared to be connected with the initial

root development of the plant. Alfalfa fixed very little nitrogen during the first crop before the flowering stage. After this stage fixation took place very readily in one experiment, and in all cases nitrogen was fixed to the full capacity during the second and the following crops.

Previous to the full establishment of the process of nitrogen fixation, inoculated alfalfa was influenced both as to yield and nitrogen content by the nitrogen content of the soil, higher yields and nitrogen content being obtained with plants receiving more combined nitrogen. However, when once a full stand was obtained and the process of nitrogen fixation was fully established, higher yields of dry weight of tops sometimes resulted from the addition of large quantities of sodium nitrate; but no effects on the percentage of nitrogen in the tops or roots could be observed. On the other hand, indications were observed in some cases that higher percentages of nitrogen were obtained with inoculated plants receiving no combined nitrogen.

There was a gradual increase in the percentage of nitrogen of the tops from the first up to the third or fourth crops with inoculated as well as with uninoculated alfalfa. This was independent of the nitrate content of the soil. The amounts of nitrogen fixed in all cases were inversely proportional to the amounts of soluble soil nitrogen at the disposal of the plants. On soils depleted of nitrogen, gains in nitrogen resulted from the growth of six crops of inoculated alfalfa when the tops were removed. On the other hand losses in nitrogen occurred from soils well provided with this element in available form. These losses were nearly proportional to the amounts of nitrates furnished by the soil. From 30 to 50 per cent of the total nitrogen of alfalfa plants was found in the roots.

Pot culture experiments with soy beans likewise indicated that small quantities of combined nitrogen are desirable for the early growth of the plants and for the best nodule development. This was much less pronounced than with alfalfa. Tops and roots of uninoculated soy beans were directly influenced as to both yields of dry weights and nitrogen content of tops by the amounts of combined nitrogen in the medium. Tops of inoculated soy beans were scarcely influenced with regard to nitrogen content by the combined nitrogen in the medium, but some increases in the yields of dry weights of tops resulted, especially in the early stages of growth, from higher applications of nitrates. Inoculated and uninoculated soy bean plants absorbed nitrates at approximately the same rate. The removal of tops of inoculated soy beans caused a slight gain in the nitrogen content of one soil of medium fertility. Losses occurred from soils richer in nitrates, and these were larger with the larger amounts of nitrates in the soils. Approximately 8 per cent of the total nitrogen of soy bean plants was found in the roots.

Nodule development by alfalfa and soy beans was adversely affected by the presence of larger amounts of nitrates in soil or sand cultures. The same effect was obtained when the nitrates were supplied in small quantities and distributed over the entire vegetation period of the plants. No injury to the bacteria could be detected from even very high concentrations of nitrates in soil or sand cultures. There appeared to be a close correlation between the total mass of nodules developed and the amounts of nitrogen fixed.

Azotobacter in the soils of Finland [trans. title], W. BRENNER (*Geol. Komm. Finland, Agrogeol. Meddel. 20 (1924), pp. 15, figs. 2; abs. in Chem. Abs., 19 (1925), No. 21, p. 3341*).—Studies of 200 soil samples from various parts of Finland are reported which showed that Azotobacter are rare in the cultivated soils of Finland, and are therefore not an important factor in the nitrogen supply. This condition is due to the relatively strong acidity or the weak buffer action of these soils.

Many of these soils present conditions unfavorable for Azotobacter, even after the addition of calcium carbonate. These include peat and swamp soils, some clays rich in electrolytes, and the iron bearing strata of podsol soils. It is concluded that the Azotobacter test can not be used to indicate the lime requirement of Finnish soils.

Soil fertility studies (*New Hampshire Sta. Bul. 221 (1926), pp. 39, 40*).—Data collected by F. S. Prince and T. G. Phillips from experimental fields are tabulated and briefly discussed.

Physiological importance of nutrient extracts; determination of the fertilizer requirements of soils by chemical means [trans title], E. Blanck and F. Alten (*Jour. Landw., 73 (1925), No. 3, pp. 219–230*).—Studies conducted at the University of Göttingen are reported which showed that only dilute acids are useful for determining the content of available phosphoric acid in soil. This is true only when the carbonate content of the soil is disregarded. Under these conditions 1 per cent nitric acid, 1 per cent acetic acid, and 0.5 per cent citric acid were found useful. However, extracts obtained from soil with water saturated with carbon dioxide apparently had no value in this connection.

Questions relating to the Neubauer seedling method [trans. title], M. Nakagawa and W. Benade (*Landw. Jahrb., 62 (1925), No. 6, pp. 809–824, figs. 3*).—Studies conducted at the Berlin Agricultural Academy on this method for determining the availability of the nutrient material in soils are reported.

It was found that the assimilation of available potash and phosphoric acid by rye seedlings reaches its peak on the fourteenth or fifteenth day after planting. Light and temperature apparently had little influence on the dissolving action of seedling roots on soil nutrients during the test period.

A comparison of different varieties of wheat, barley, and oats with rye for the method showed that the barley and oats varieties removed less potash and phosphoric acid from the test soils than did the wheat, and considerably less than did rye. There were variations in this respect among individual varieties which could not be attributed to variety peculiarities. It is concluded, therefore, that the kind of experimental seedling is a factor for consideration in the further development of this method.

The Neubauer method and the determination of the nitrogen requirement of soils [trans. title], E. Blanck and F. Scheffer (*Ztschr. Pflanzenernähr. u. Düngung, 4 (1925), No. 12, Wirtschaft.-Prakt., pp. 553–556*).—Studies conducted at the University of Göttingen are reported which showed that under the experimental conditions employed, the Neubauer seedling method was inadequate for determining the requirement of the experimental soils for nitrogen.

The Neubauer method for determining the phosphoric acid and potash in soil available to roots [trans. title], H. Hähne (*Ztschr. Pflanzenernähr. u. Düngung, 6 (1926), No. 4, Wiss., pp. 238–248, fig. 1*).—Studies conducted at the University of Jena are reported which indicated that the Neubauer method has no quantitative value. Suggestions are made for strengthening the method.

Determination of the fertilizer requirements of a soil by means of plant and soil analyses [trans. title], W. Lange (*Ztschr. Pflanzenernähr. u. Düngung, 6 (1926), No. 4, Wiss., pp. 193–228*).—The results of a number of studies conducted at the University of Göttingen are reported which showed that the hydrochloric acid extract of soils is incapable of satisfactorily indicating the availability of the soil phosphoric acid. The potash content was indicated in this way under limited conditions.

Better results were obtained by use of the Neubauer seedling method. However, this method did not permit the establishment of a dividing line between a deficiency and a sufficiency of phosphoric acid in soil.

The results for sodium and potassium obtained by this method correspond with the results of pot experiments. The results for calcium were not so favorable. The results of pot experiments alone gave an indication of the nutrient supply of soils, which, however, in no case fully confirmed the relation between the molecular ratio of the constituents of the hydrochloric acid extract and the fertilizer requirements of a soil advanced by Ganssen.

Importance of stable manure and green manure for the carbon dioxide nutrition of plants [trans. title], O. LEMMERMANN and K. ECKL (*Ztschr. Pflanzenernähr. u. Düngung, 3 (1924), No. 2, Wirtschaft.-Prakt., pp. 47–57*).—Studies are reported which showed that the shallow plowing under of manure and green manure will effect natural carbon dioxide fertilization only under exceptional conditions. Better results are as a rule produced by deeper plowing under of these materials. Further value of the latter practice is its influence on ammonification and nitrification.

In this connection it was found that soil ventilation takes place in most German agricultural soils to a depth of 30 cm. (11.8 in.), so that deep plowing under of organic matter permits unhindered carbon dioxide production. The fact that under certain conditions it is better to leave stable manure on the surface of the soil for some time before plowing under is considered to have no connection with the carbon dioxide question.

New views on the utilization of liquid manure and stable manure [trans. title], E. TRUNINGER (*Schweiz. Landw. Monatsh., 3 (1925), Nos. 4, pp. 88–92; 5, pp. 103–116, fig. 1*).—A review of available information is presented which deals largely with the chemistry and biology of liquid and stable manures.

Influence of straw fertilization on yield [trans. title], GERLACH (*Ztschr. Pflanzenernähr u. Düngung, 4 (1925), No. 12, Wirtschaft.-Prakt., pp. 534–550*).—Studies are reported which showed that soil and fertilizer nitrogen which was first fixed through the agency of straw and later again mineralized was only partially available to crops during a period of six years. The greater part of this nitrogen was either leached out or lost by evaporation during the time when no crops were grown.

The action of superphosphate on acid soil [trans. title], H. KAPPEN (*Deut. Landw. Presse, 52 (1925), Nos. 41, pp. 484, 485; 42, pp. 496, 497*).—Studies are reported which showed a marked action of superphosphate on acid soils. This action was not particularly influenced by the addition of lime, either before or after the use of other fertilizers. It is concluded that the fixation of water-soluble phosphoric acid from superphosphate is no more permanent in acid soils than in neutral soils. The presence of free ammonia and free iron oxide did not decrease the action of aluminum and iron phosphates.

Action of potash waste liquors on soil and plants [trans. title], O. NOLTE and A. GEHRING (*Landw. Jahrb., 62 (1925), No. 5, pp. 645–653*).—The results of fertilizer experiments on meadow which is flooded more or less constantly the year round with river water containing potash waste liquors are reported. The results did not confirm previous findings that potash waste liquors are injurious to meadow soils and vegetation.

Action of dolerite meal on plant production [trans. title], E. BLANCK and F. ALTEN (*Jour. Landw., 73 (1925), No. 3, pp. 213–218*).—Further experiments on the subject at the University of Göttingen (E. S. R., 54, p. 422) showed that dolerite meal has no importance as a fertilizer for practical conditions.

Reaction and lime requirement of soils [trans. title], H. NIKLAS and F. VOGEL (*Landw. Jahrb. Bayern, 15 (1925), No. 5–6, pp. 233–259*).—Studies were conducted which showed that a large proportion of Bavarian agricultural soils are deficient in lime. The relatively highest lime requirement figures were given by the series of soils originating from the underlying rock. Some of the

sand soils and the surface loam soils of high terraces in the Alps country were also found to be acid, especially where they are deeper than the depth of plowing.

Injurious action of excessive lime additions [trans. title], E. W. Bobko [E. V. Bobko], B. A. Golubew [Golubev], and A. F. Tülin [Tiulin] (*Ztschr. Pflanzenernähr. u. Düngung, 6 (1925), No. 2-3, Wiss., pp. 128-168*).—Studies conducted at the Moscow Agricultural Academy are reported which showed that both peat and mineral soils are injured by excessive liming.

Uncultivated light mineral soils were especially injured by such treatment. A reaction of pH=8 was produced, and biological processes were disturbed. As a consequence, large quantities of lime, bicarbonates, ammonia, nitrites, and nitrates accumulated in the soil solution.

Plant injury occurred when large quantities of ammonia accumulated in an already alkaline solution. This injurious condition was removed when the ammonia was nitrified or became insoluble. Leaching of the soil at the proper time also prevented injury.

No plant injury was observed on heavy soils as a result of excessive liming, although the pH values reached 7.9 to 8. Ammonia did not accumulate in such soils under such conditions. This is taken to indicate that strong alkalinity alone is not sufficient to cause plant injury. Heavy liming of garden compost, which produced a heavy crop of vetch, resulted in a rapid injury and a decrease in yield.

The production and use of sulfate in humid and arid soils as affected by cropping and sulfur treatments, W. W. Johnston (*Soil Sci., 21 (1926), No. 3, pp. 233-244, figs. 2*).—Studies conducted at the Missouri Experiment Station are reported which showed that the crop grown on western soil that has given returns for sulfur has retarded the formation of sulfate. Crop growth on humid soils increased the production of sulfate and thus probably helped to supply the crop with this material.

Under conditions of higher H-ion concentration, as was the case with the humid soils tested, it seemed probable that crops may be able to extract sulfur more readily from the soil and therefore not to require so great a continuous supply as when grown on semiarid soils. It was found, furthermore, that humid soils may recuperate more readily in their sulfate content and hence have a sufficient supply of sulfate for the crop at practically all times. On the other hand, it was more difficult for some of the semiarid soils such as Redmond medium sand to regain enough sulfate for satisfactory growth after it once had been depleted. It is concluded that this condition will most likely be found in field practice where perennial sod crops have occupied the land for a considerable time, and that it may offer some explanation for the marked returns that have been obtained from the use of sulfur on certain alfalfa lands in the semiarid regions of the West.

AGRICULTURAL BOTANY

The physiology of plants, G J. Peirce (*New York: Henry Holt & Co., 1926, pp. X+363*).—The differences between the author's first book (E. S. R., 15, p. 122) and the present somewhat enlarged volume are said to represent the differences due to time, the changes in interest, and the changes in perspective, both general and individual. Departures from the usual in treatment are said to be in part by way of suggestion for the future of the science, in part for convenience of the reader. No bibliography is given, but footnotes give references to the literature as late as 1925.

The rôle of plant physiology in agriculture, G. L. C. HOWARD (*Indian Sci. Cong. Proc. [Calcutta], 10 (1923), pp. 169–181, figs. 3*).—"As the immediate need, when agricultural investigation was started in India, was for better varieties, that aspect of agricultural botany which deals with the improvement of crops is being extensively developed." This and other phases of the agricultural problem are synthetically discussed.

The employment of paraffined glass containers in culture experiments [trans. title], R. CERIGHELLI (*Bul. Soc. Bot. France, 71 (1924), No. 7–8, pp. 783–786*).—Reporting on work related to studies of Maquenne et al., some of which have been noted (E. S. R., 50, p. 128), the author presents data from comparative studies on root and stem growth of pea and on wheat plantlets in pure water in quartz tubes and in water with lime in paraffined glass tubes. It is stated that paraffined tubes are suited to culture experiments. In such tubes, as in quartz tubes, very small quantities of lime exert a favorable influence on seed germination.

Some particulars regarding the development of plastids [trans. title], L. K. TCHANG (*Bul. Soc. Bot. France, 71 (1924), No. 5–6, pp. 656–666, pl. 1, figs. 2*).—Studies are reported as applied to bean, pea, and potato.

The absorption of solutes with special reference to balanced solutions, H. P. HIBBARD (*Michigan Sta. Rpt. 1925, p. 209*).—The author claims, as the result of a great many experiments over a period of years, that it may be concluded that unless an unknown variable is effective the ratio of salts may vary quite widely without an appreciable influence on the yield. So long as the essential salts are present the proportions in which they occur are of little significance.

The retarding effect of carbon dioxide on starch formation, T. EKAMBARAM (*Abs. in Indian Sci. Cong. Proc. [Calcutta], 10 (1923), p. 183*).—The author studied the effect of carbon dioxide on the upgrade metabolic processes during germination, the material used being embryos of barley excised from the dry grains.

Although wheat and barley embryos are known to have no starch as stored material in the dried grains, starch appears in the embryos, even when they are separated from the grains, within a few hours under conditions of germination.

"Excised embryos of barley were placed in different concentrations of CO_2 in the presence of 20 per cent of oxygen and qualitative and quantitative observations were made on three factors, namely, starch formation, elongation, and increase in weight. The results showed that all the three factors were affected progressively by increasing concentrations of CO_2 in the atmosphere. It is therefore concluded that the depressing effect of CO_2 is not due to changes in physical characteristics such as permeability but is due to a change in some phase of metabolism."

Growth of maize seedlings as affected by glucokinin and insulin, W. H. EYSTER and M. M. ELLIS (*Jour. Gen. Physiol., 6 (1924), No. 6, pp. 653–670*).—Solutions of glucokinin and insulin increased growth of roots and tops of young maize seedlings. Strong solutions of crude glucokinin or of crude insulin repressed growth. Recent removal of tips of primary roots showed an increase in both top growth and root growth, apparently due to an increased absorption of certain substances.

"Purification of crude glucokinin and crude insulin by dialysis showed that the residue of relatively nondialyzable substance was the growth-promoting fraction. The dialysate of crude glucokinin contained at least three types of material, one of which repressed growth. . . . Experiments with albino seed-

lings suggested that the greater gain in weight made by plants treated with insulin was the result in part of increased photosynthetic activity."

An abnormal inflorescence and its reversion to vegetation in the marigold, S. C. BANERJI (*Abs. in Indian Sci. Cong. Proc.* [*Calcutta*], *10* (*1923*), *p. 181*).—An inflorescence abnormality associated with sterility in marigold and ascribed to overnutrition is described.

Further changes of sex in the andromonoecious types of papaya, L. B. KULKARNI (*Abs. in Indian Sci. Cong. Proc.* [*Calcutta*], *10* (*1923*), *p. 187*).—Observations are outlined which are considered to show the connecting link between the staminate, the hermaphrodite, and the pistillate flowers of papaya appearing at different stages on the same andromonoecious plant. "These floral characters may prove of importance in breeding."

The symbiosis of seeds and bacteria: Indigo and poppy seed, G. J. FOWLER and R. K. CHRISTIE (*Abs. in Indian Sci. Cong. Proc.* [*Calcutta*], *10* (*1923*), *p. 184*).—Cultural tests showed that indigo seeds contain specific bacteria, apparently all of one kind. Antiseptic treatment destroying these bacteria affected adversely the germination of such seeds. When poppy seed were scattered from the head on agar plates no bacterial growth occurred, but when the seeds were first crushed aseptically abundant growth occurred after transfer to the plates. Again the bacteria appeared to be all of one kind, but their precise function was not ascertained.

The occurrence of purple bacteria as symbionts of a lichen, J. C. T. UPHOF (*Amer. Jour. Bot.*, *12* (*1925*), *No. 2*, *pp. 97–103*, *figs. 6*).—A technical description is given of a purple bacterium becoming free soon after division, and herein named as a new species, *Rhodobacterium lichenophorum*, which is said to have been discovered in apparent symbiosis with at least the fungus which is associated with an alga to form the lichen *Chiodecton sanguineum*. The author suggests that "as it is supposed that the lichen genus Chiodecton lives in symbiosis with Trentepohlia, an alga, instead of with a purple bacterium, that the name of the species of lichen in question should be changed to *Rhodobacteriophora sanguinea*. It would not be surprising if *Rhodobacterium lichenophorum* were found also to occur occasionally upon other species of lichens."

Seeds and plants imported by the Office of Foreign Plant Introduction, Bureau of Plant Industry, during the period from October 1 to December 31, 1923 (*U. S. Dept. Agr., Inventory 77* (*1926*), *pp. 20*).—Lists and economic notes are given of some 400 lots of seeds and plants introduced by the U. S. Department of Agriculture for testing purposes.

GENETICS

[Chromosome studies in the rabbit], T. S. PAINTER (*Abs. in Anat. Rec.*, *31* (*1925*), *No. 4*, *p. 304*).—Two papers are presented.

The chromosomes of the rabbit.—Chromosome counts on the amniotic cells of 12 embryos gave a constant diploid number of 44. In females the chromosomes were paired so that all had mates of similar size and shape, but in the males there was one pair in which one chromosome was medium sized and the other small. A study of spermatogenesis confirmed the somatic count and identified the X and Y sex chromosomes in the first maturation division.

A comparative study of the chromosomes of the largest and the smallest races of rabbits.—Studies of the chromosomes of Flemish Giant and Polish rabbits indicated that the chromosomes of the two types were alike in number, size, and shape.

Number and behavior of the chromosomes in Cavia cobaya (the common guinea-pig), M. T. Harman and F. Root (*Abs. in Anat. Rec., 31 (1925), No. 4, p. 307*).—Studies of the chromosome numbers in guinea pig testicles indicated that the diploid number is 38 as observed in spermatogonia. The chromosomes were arranged in 18 similar pairs, with 1 unlike pair designated as the sex chromosomes. It was also observed in this study that the actively dividing cells of the lining of the seminiferous tubules were limited to the elliptical areas, which never exceeded two-thirds of the circumference of the tubule. One male which appeared to be superactive showed larger areas of actively dividing cells.

The chromosomes of Doctor Nabour's parthenogenetically produced Tettigidae, W. R. B. Robertson (*Abs. in Anat. Rec., 31 (1925), No. 4, pp. 307, 308*).—Bisexually produced females of this species have been found to possess 14 chromosomes in their germ and somatic cells. Parthenogenetically produced females show in their cells figures with 7 unpaired chromosomes and also figures with 14 chromosomes, with some characteristic differences in the arrangement of the chromosomes. These results indicate that the parthenogenetically developing egg must have undergone maturation division, resulting in 7 unpaired chromosomes which have further divided by fission to form the 14 chromosomes, while other groups have formed separate nuclei with only 7 chromosomes, thus resulting in a mixture of cells containing 7 and 14 chromosomes in the same individual.

The chromosomes in the cells of the embryonic membranes in the India runner duck, O. Werner (*Abs. in Anat. Rec., 31 (1925), No. 4, p. 308*).—Studies of the chromosome numbers in 8 embryos from 8 to 12 days' incubation have indicated that the cells of the males probably contain 76 chromosomes with 77 in the cells of the female, although some of the chromosomes are very small and have made the counting difficult. There are recognized 5 pairs of large chromosomes in the male and 5 pairs plus an unpaired chromosome in the female, with a graduated series of 22 pairs which have been distinguished in both sexes. Twenty-two chromosomes are so small that it has been impossible to pair them. It is also noted that in the late prophases 10 of the intermediate sized chromosomes appeared to be connected end to end by interchromosomal filaments.

Chromosome behavior in Sciara (Diptera), C. W. Metz (*Abs. in Anat. Rec., 31 (1925), No. 4, pp. 346, 347*).—The chromosomes of 4 species of Sciara have been studied. In the females there are 4 pairs of chromosomes and in the males 4 pairs plus 2 larger sex-limited chromosomes. During spermatogenesis there appears to be no synapsis. In the second spermatocyte division 5 chromosomes, including both the sex-limited ones, divide normally, while both halves of the sixth go to one pole, which remains in the spermatid while the other pole is budded off. Thus all spermatids receive both sex-limited chromosomes. Since females must be fertilized to produce offspring it is tentatively suggested that females are produced by gynogenesis (sperm merely stimulating eggs) and males bisexually, and that in males maternal chromosomes are qualitatively different from paternal ones and possibly are cast out at the first spermatocyte division.

Polyploid mutations in Crepis. Triploid and pentaploid mutants of Crepis capillaris, M. Navashin (*Genetics, 10 (1925), No. 6, pp. 583–592, figs. 8*).—A triploid and a pentaploid mutation were discovered among 150 seedlings of *C. capillaris*. Three sets of three homologous chromosomes, identifiable by their characteristic form, were found in the nuclei of the triploid individual, and 3 sets of 5 homologous chromosomes in the nuclei of the pentaploid. The author suggests that these mutants owe their origin to the unusual climatic conditions (Tiflis, Russia) under which their parents grew, which so

influenced the reduction division that some of the spores (more probably microspores) arose without reduction, thus giving rise to pollen grains with diploid nuclei. The pentaploid individual is believed to have arisen from the combination of a tetraploid gamete with a normal haploid one.

Mutations in Drosophila virilis and their bearing on the homology of genes, A. WEINSTEIN (*Abs. in Anat. Rec., 31 (1925), No. 4, pp. 345, 346*).—Three mutations in *D. virilis*, white eye and wee wing, both sex-linked recessives, and beaded wing, a III chromosome dominant lethal, are described and discussed in connection with a comparison of the corresponding relation between the genes in the chromosomes of *D. virilis* and *D. melanogaster*. Certain differences are pointed out, and it is suggested that a rearrangement of the genes in the first chromosomes has occurred during the course of evolution and that the homologous autosome genes are less certain than the sex-linked genes.

Five new color factors in guinea-pigs, H. L. IBSEN (*Abs. in Anat. Rec., 31 (1925), No. 4, p. 355*).—The operation of five new color factors in the guinea pigs is described from the Kansas Experiment Station. These are designated as the fading factor, a gene which fades yellow into cream several months after birth; darkening factor, a gene which makes cream individuals more intense with age; white tipping, a gene which acts on chocolate hairs but has no noticeable effect on red hairs; black tipping, a gene acting on reds and dark-eyed whites at from 6 to 18 months after birth; and kodak, a gene tending to produce black or chocolate pigment in the hair of pink-eyed whites of the composition $pp\ c^p — Cr\ Cr$.

Inheritance of plumage color in the Rhode Island Red breed of domestic fowl, F. A. HAYS (*Abs. in Anat. Rec., 31 (1925), No. 4, pp. 354, 355*).—In studies of the inheritance of Rhode Island Red plumage color at the Massachusetts Experiment Station it has been found that three genes are of particular concern to the breeder of standard color. *B* determines reddish-brown pigment and acts only in the presence of either or both of the other genes, *L* is sex linked and modifies the distribution and intensity of brown pigment, and *E* is concerned in the distribution of melanic pigment. *B* and *E* are autosomal genes. The desired shade of red in the male is dependent upon the presence of *BB* and *L*—. Females, of course, can carry *L* only as a heterozygote since it is sex linked. *E* is responsible for smut in the undercolor and stippling in various portions of the body, and should not be present in either males or females. The presence of various other genes described by other workers is also noted.

The genetic relations of some shank colors of the domestic fowl, L. C. DUNN (*Abs. in Anat. Rec., 31 (1925), No. 4, pp. 343, 344*).—In studies of the inheritance of shank colors in fowls at the Connecticut Storrs Experiment Station, crosses between varieties differing in shank color have indicated that the inheritance of yellow, white, slate (blue, gray), and green (greenish black, willow, light green) may be explained on the basis of two main factors: *W*, which determines the inhibition of yellow in the epidermis and is present in birds with white, pinkish-white, pearl, blue, slate, and gray shanks, and *Y*, which determines inhibition of melanic pigment in the dermis and is present in white, pearl, and yellow-shanked fowls. *W* is nonsex linked, while *Y* is sex linked. The genetic constitution of various types studied is given, and a mosaic is noted in which the left leg is green and the right leg slate.

Data on the inheritance of spurs in the female of domestic poultry, H. D. GOODALE (*Abs in Anat. Rec., 31 (1925), No. 4, p. 343*).—The inheritance of spurs in females has been studied by crossing a strain of poultry in which 50 per cent of the females bore well-developed spurs with a Cornish male in which the spurs on the females were never observed. The F_1 females had no spurs, but

1 spurred female appeared in 29 F_2s. In addition, 1 female had a spur on one shank only. Larger percentages of spurred females were produced by back crossing these birds to the spurred race, and 2 birds produced 50 per cent of spurred daughters when mated to an F_1 male.

On a Mendelizing structural defect of the retina producing blindness in the house mouse, C. E. Keeler (*Abs. in Anat. Rec., 31 (1925), No. 4, p. 341*).—A brief account is given of an ophthalmic anomaly, characterized by the complete absence of rod and external molecular layers from the retina, with a reduction of external nuclear layer which causes total blindness and appears to be inherited as a nonsex-linked Mendelian recessive. Modifying factors are also operative.

A case of non-disjunction of an autosome in mammals, W. H. Gates (*Abs. in Anat. Rec., 31 (1925), No. 4, pp. 341, 342*).—In a cross between a Japanese waltzing (recessive) and a normal fancy mouse (homozygous dominant), a waltzing female was obtained in the F_1, though all her sibs were normal. Various explanations for the occurrence of this individual have been tested, from which the most likely appears to be that this individual is a result of nondisjunction, since when the exceptional animal was mated to waltzers the F_2s were all waltzers and when mated to normals she produced only normals. In the first type of mating the offspring were low in vitality and slow in vigor, but so far have not been tested by inter se matings. Offspring of the second mating are those that produce waltzers and those who do not produce waltzers, i. e., showing an absence of this gene as accounted for on the basis of nondisjunction.

An interracial cross in Drosophila obscura producing partially fertile hybrids, D. E. Lancefield (*Abs. in Anat. Rec., 31 (1925), No. 4, p. 346*).—A stock of *D. obscura* obtained from Eugene, Oreg., has been found to cross with older stocks with some difficulty. The hybrid males are sterile, but the hybrid females can be back-crossed to some extent with males of either race. Among the offspring the sex ratios are variable, half the sons have very small testes and are sterile, crossing over is greatly reduced at both ends of the X chromosome, and a few repeated back-crosses of hybrid females give perfectly fertile males and females. The size and shape of the Y chromosome have been found to differ in the two races.

Species crossings in Malva, K. B. Kristofferson (*Hereditas, 7 (1926), No. 3, pp. 233–354, figs. 33*).—In this comprehensive study upon hybridization in Malva the author found that F_1 hybrid between *M. alcea* and *M. moschata*, two species belonging in the section Bismalvae, were totally sterile in the ovules and nearly so in the pollen. In the Fasciculatae section hybrids between *M. parviflora*, *M. pusilla*, *M. neglecta*, and *M. silvestris* were generally fertile, and all showed intermediate segregation. Hybrids between these four species and *M. crispa* were difficult to obtain and highly sterile, with segregation very irregular. Attempts to cross the species in the two sections resulted in no or nonviable seed.

Sex in a fraternity of pigeons obtained from an interfamily cross, O. Riddle (*Abs. in Anat. Rec., 31 (1925), No. 4, pp. 349, 350*).—The cross of the common pigeon and ring dove in several experiments has produced only males. During the especially favorable mating season in 1923, 24 fertile eggs were produced, of which 19 offspring developed to a sufficient stage for sexing. All the birds had testicles. Fourteen lived to maturity, after which they were killed and the gonads sectioned. Two of the birds had well-formed left oviducts, and evidence was obtained which indicated that 6 of the 14 sperm-producing males were zygotic females, thus demonstrating sex reversal in these offspring.

Sex in plants compared with sex in animals, H. W. Rickett (*Abs. in Anat. Rec., 31 (1925), No. 4, p. 353*).—The chromosome relations to sex in animals and plants are compared and the differences pointed out, with the suggestion that if the word sex is to be applied in the ordinary way to animals it is possible that some other term should be used to apply to those stages of plants that have no analogy in animals.

The relation of the mammalian follicular hormone to the development of secondary sexual characters, W. W. Swingle, W. Wenner, and M. Steggerda (*Abs. in Anat. Rec., 31 (1925), No. 4, p. 338*).—In studies of the physiological action of the follicular hormone, 1 Brown Leghorn and 8 Rhode Island Red chicks, castrated before any signs of typical male plumage occurred, were injected intraperitoneally once each week with 3 cc. of clear follicular fluid obtained from ripe follicles of hogs. Two birds died about 6 weeks after the experiment started. Both showed a few cock feathers. The others dying after 11 weeks were typical capons with male plumage. The other two after having received 55 cc. of the follicular fluid were cock feathered with the head plumage of capons. The authors concluded from this that the follicular hormone is a reproductive hormone with its sphere of influence confined to the female genital tract, and that it is not the principal female sex hormone, which is primarily associated with sex differentiation.

The ovarian follicular hormone: Variations in amount in pig, cow, and human ovaries during the oestrous and menstrual cycles, E. Allen (*Abs. in Anat. Rec., 31 (1925), No. 4, p. 339*).—In searching for the possible cause of differences between the oestrous cycle of the lower animals and the menstrual cycle of Primates, quantitative analyses have been made of the amount of follicular hormone found during the different periods of the cycle in pigs, cows, and human beings. The ovaries of pigs and cows have shown high yields during oestrum when the follicles are large, with negative results after oestrum when the corpora lutea are developing. Human ovaries show high hormone contents in the fluid from large follicles, and differ from the pigs and cows by showing the presence of large amounts in corpora lutea.

The fertility behavior of the black rat, Mus rattus, a wild species under domestication, H. W. Feldman (*Abs. in Anat. Rec., 31 (1925), No. 4, p. 341*).—Fertility has been studied in 905 animals, consisting of the descendants of 4 generations of wild *M. rattus*, wild *M. alexandrinus*, and 9 specimens of a cage-bred strain of *M. rattus*. Hybrids between the two species were obtained, and all formed a homogeneous population in regard to anatomical characters, but individual variability in fertility was marked. More than 50 per cent of the animals were excessively nervous and reared no young, but their frequency decreased in successive generations. Approximately one-fourth of the males became excessively fat, which resulted in sterility. Psychical incompatibility is given as the cause of much sterility in the remainder of the population. Females refused to mate with certain males. The fertility decreased in successive generations, although the most fertile rats were used for breeding in each generation.

The non-functioning of the genes in spermatozoa, H. J. Muller and F. Settles (*Abs. in Anat. Rec., 31 (1925), No. 4, p. 347*).—A comparison was made of the sex ratios among 4,000 Drosophilae derived from fresh sperm and among 1,500 derived from sperm that had been retained over 1 week in the body of the female at 26° C., but no significant difference was observed. Thus it appears that the genes distinctive of the X chromosome do not function while in the spermatozoa in maintaining the activity and life of the latter. Further experiments showed that the absence of an entire section of the second chromosome did not reduce the viability and activity of spermatozoa in

which such a condition occurred. The conclusions from these results are that the genes in spermatozoa are dormant, and that the cytoplasm functions by utilizing only material produced during the operation of the prematuration diploid nucleus. Thus selective action discriminating between spermatozoa on the basis of their genetic composition would be impossible except where there is an associated morphological difference.

Germ-cell history of the male rat from its origin to maturity, G. T. HARGITT (*Abs. in Anat. Rec., 31 (1925), No. 4, pp. 301, 302*).—In studies of the germ cell history from the differentiation of testis in embryos or 14 days to maturity at Syracuse University, the histological changes observed have been described.

The indifferent gonad and sex cords contain large and small cells. The primordial germ cells increase by mitosis and reach their maximum in embryos of 17 days, but later degenerate and completely disappear by 9 days after birth. Following the disappearance of the large cells, indifferent epithelial cells descending from the small cells of the genital ridge fill the solid seminiferous tubules and later produce both the germ cells and the Sertoli cells. At 15 days after birth spermatogonia begin to form, at 23 days spermatocytes appear, and spermatids are first observed at about 33 days with perfect spermatozoa at 48 days of age, but Sertoli cells are not apparent until almost puberty. The testes enter the inguinal canals at 23 days and the scrotum at 33 days.

The biology of the mammalian testis and scrotum, C. R. MOORE (*Quart. Rev. Biol., 1 (1926), No. 1, pp. 4–50, figs. 8*).—A thorough review of the results of experimental work bearing on the factors affecting spermatogenesis and the internal secretions of the testicle is presented, including an analysis of the theories which appear to be most logical. The effects of cryptorchidism, vasectomy, testis transplantation, X-rays, and the thermoregulatory power of the scrotum (E. S. R., 53, p. 428) on spermatogenesis are taken up in the different sections. Peculiar cases of hypersensitiveness of the testicles and reactions in case of illness are explained to a greater or less extent from the influence of temperature on germinal tissue. Various theories of the origin and factors influencing the internal secretions of the testicles are discussed, from which it appears that many are conflicting and that some of the more popular do not appear to be supported by experimental evidence. The bibliography includes 212 references.

Testicular displacement and temperature regulation (rat, guinea-pig), C. R. MOORE (*Abs. in Anat. Rec., 31 (1925), No. 4, p. 303*).—In continuing studies of the temperature regulation of the testicle (E. S. R., 53, p. 428) in the rat and guinea pig, testes transplanted into the abdominal cavity or under the skin leaving the vas deferens, nerve, and blood supply intact were studied histologically. The tubules of the testicles implanted subcutaneously contain spermatogonia, spermatocytes, and spermatids with quantities of mitotic figures, although spermatozoa were not observed. The abdominal testes, however, showed only the presence of Sertoli cells in the seminiferous tubules. The difference is explained on the basis of differences in heat regulation.

A new method of assaying the potency of the female sex hormone based upon its effect on the spontaneous contraction of the uterus of the white rat, R. T. FRANK, C. D. BONHAM, and R. G. GUSTAVSON (*Amer. Jour. Physiol., 74 (1925), No. 2, pp. 395–399, figs. 3*).—The spontaneous contractions of isolated uteri of spayed rats and of rats in different stages of the oestrus cycle were found to differ materially in frequency when such uteri were suspended in oxygenated Ringer's solution. The female sex hormone slows the contractions,

and it is suggested that the potency of extracts of this hormone may be tested by application in this way.

An inhibition in ovulation in the fowl by the intraperitoneal administration of fresh anterior hypophyseal substance, A. T. WALKER (*Amer. Jour. Physiol., 74 (1925), No. 2, pp. 249–256*).—The intraperitoneal administration into laying hens of preparations of the fresh anterior lobe of the hypophysis of beef was found to inhibit ovulation. Control animals showed an unbroken laying record, while the injected animals did not lay for over 15 days except for the first 5 days after the treatment when the 2 or 3 eggs present in the oviduct at the time of the administration of the drug were laid.

A microscopical study of sections of ovaries of 2 treated and 2 control birds showed that when the treatments stopped laying, the ovaries were small and contained small atresic follicles, while the ovaries of the control birds contained larger follicles as well as smaller ones. The treatment did not produce any toxic effects, as the treated animals remained in excellent health and maintained weight. The effect on ovulation appears to be directly due to an injurious effect on the developing ova.

Factors influencing the number of corpora lutea in mice; parity vs. age, E. C. MACDOWELL and E. M. LORD (*Abs. in Anat. Rec., 31 (1925), No. 4, pp. 342, 343*).—The corpora lutea counts of females obtained at successive litters has indicated that within each age class for females the corpora lutea count is successively higher for second litters than for first litters, for third litters than for second litters, for fourth litters than for third litters, and for fifth litters than for fourth litters. The differences, however, get smaller after the maximum count for the third litter. In the same parity there is no general tendency for the averages to increase with the age of the mother. Thus the results indicate that the previous reproductive activity of the mouse has more influence upon the number of ova produced than the age of the female.

Further experiments with X-rayed mice and their descendants, H. J. BAGG, E. C. MACDOWELL, and E. M. LORD (*Abs. in Anat. Rec., 31 (1925), No. 4, p. 342*).—In continuing the studies of the effects of X-rays on production of abnormalities of mice (E. S. R., 52, p. 131), it was found that abnormalities occurred among the offspring, when both parents were treated, at the rate of 0.35 per cent, when one parent was treated, at the rate of 0.24 per cent, and for the same parents before treatment, at the rate of 0.20 per cent. The defectives produced died without having young in most cases, but in those tested genetically no evidence of simple Mendelian inheritance was observed, although the defects might be found in later generations. Although the results appear to be negative, the authors point out that the chances would be very small for a germ cell modified by the X-ray to survive the normal competition of gametes and zygotes in reaching maturity.

FIELD CROPS

[Field crops investigations in Florida], W. E. STOKES, R. W. RUPRECHT, and G. E. TEDDER (*Florida Sta. Rpt. 1925, pp. 19–27, 31, 32, 94, figs. 2*).—Further experiments (E. S. R., 54, p. 325) reported on included variety tests with corn, sweet corn, sorgo, peanuts, oats, and *Crotalaria* spp.; fertilizer trials with oats, peanuts, Napier grass, and potatoes; breeding work with peanuts and Napier grass; an irrigation test with Napier grass and Japanese cane; comparisons of silage crops and leguminous hay crops; tests of winter legumes; and studies of pasture and lawn grasses.

Bahia grass, centipede grass, and *Panicum repens* appeared most promising of the new pasture grasses and centipede grass among the new lawn grass-

A very light covering gave better results than no covering, and thorough preparation of the land before seeding pasture mixtures made the best stands and growth on high pine and on flatwoods land. Within certain limits, the kind of pasture mixture and the type of land used appeared to largely determine the best date of seeding, and rainfall also seemed to be an important factor.

[Agronomic work in Idaho in 1925] (*Idaho Sta. Bul. 142* (*1926*), *pp. 13, 14, 19, 23–25*).—Varietal leaders at the station included Triplet, Mosida, and Jenkin winter wheat, Ridit and White Odessa as smut resistant wheats, Jenkin, Bluestem, Little Club, Baart, Red Bobs, and Federation spring wheat, Trebi barley, and Idamine and Markton oats. Carbon disulfide continued to be effective in the eradication of bindweed if applied at the proper time and rate, and legumes receiving gypsum again produced profitable increases. To render maximum yields peat soils seemed to need phosphorus and potash applications. Off-type seed potatoes from a field thoroughly rogued during the growing season seemed good for seed stock, providing this condition is due to unfavorable soil and climatic factors.

Although peas apparently made a better nurse crop at the Aberdeen Substation for sweet clover than barley, oats, or wheat, the sweet clover gave much better results seeded alone. The merits of good fallow were indicated in cultural tests with wheat.

Experiments at the Sandpoint Substation included varietal trials with wheat, oats, barley, field peas, vetch, and potatoes, seeding tests with wheat, peas, and sunflowers, comparisons of legume mixtures, and a test of gypsum with alfalfa.

[Field crops work in Michigan], A. J. Patten, J. F. Cox, and G. W. Putnam (*Michigan Sta. Rpt. 1925, pp. 215, 225, 226, 242*).—Analyses of 143 samples of Michigan wheats revealed an average content of 13.28 per cent of protein and 1.74 per cent of ash, and 11.69 and 0.45 per cent, respectively, in the flours milled therefrom. No winter wheat flours were strong enough for blending with weak flours, and in no case was bread from blended flour as good as that from the better flour.

The merits of Rosen rye, Red Rock and Berkeley Rock wheat, Worthy and Wolverine oats, Robust bean, Michigan 2-row barley, and Hardigan alfalfa, superior crop varieties developed by the late F. A. Spragg, are recited briefly.

C. R. Megee showed that Italian red clover seed is worthless for the State, that French red clover seed is comparatively inferior to northern domestic seed for Michigan, and that Argentine alfalfa seed is not adapted and its planting results in failure.

English and Cloverland field peas, Michigan 2-row barley, and Wolverine oats were outstanding among varieties at the Upper Peninsula Substation. Seeding oats and flax alone was apparently more satisfactory than seeding in combination.

[Field crops experiments in New Hampshire, 1925] (*New Hampshire Sta. Bul. 221* (*1926*), *pp. 13–19*).—In continued experiments with potatoes (E. S. R., 53, p. 431), O. Butler observed that the yields of Green Mountain and Irish Cobbler seed were maintained and even improved by early harvesting, and that the percentage and relative distribution of leaf roll and mosaic were strikingly affected. Leaf roll increased with the age of the stock very definitely with Irish Cobbler but less noticeably with Green Mountain. Seed from northern New Hampshire compared favorably with Maine and Vermont seed in field inspections and gave practically identical yields, whereas seed from southern New Hampshire behaved irregularly as to diseases and yielded less than any other seed tested.

While the mixtures used gave about the same control of early blight as far as indicated by appearance of foliage, yields obtained were as follows: 8–4–50

Bordeaux mixture biweekly 347 bu. per acre, 4-4-50 Bordeaux mixture-molasses weekly 342.4 bu., 4-4-50 Bordeaux mixture weekly 316.3 bu., and nonsprayed plants 270.8 bu. per acre. Hand spraying was also compared with hand dusting for late blight.

Fertilizer trials by F. W. Taylor seemed to indicate that in general where stable manure is used on potato land, the supplementary fertilizer need not contain more than 4 per cent of potash. The comparative yields of varieties of silage corn are tabulated. Sunflowers planted with corn in proportion of 1:8 bu. increased the tonnage materially, but such mixture cost more to harvest. No disadvantages from a milk producing standpoint appeared in feeding the sunflower silage. Grimm alfalfa inoculated with soil made about 90 per cent of a perfect stand, while that with only the seed inoculated had about a 60 per cent stand.

[Field crops investigations in India, 1924–25] (*India [Dept. Agr.] Rev. Agr. Oper., 1924–25, pp. 4–39, 43–49, 57, 60, pls. 4*).—Agronomic investigations carried on by the imperial and provincial departments of agriculture in many localities in India (E. S. R., 53, p. 632) are reviewed for the year 1924–25.

Field experiments: How they are made and what they are, [E.] J. Russell (*Jour. Min. Agr. [Gt. Brit.], 32 (1926), No. 11, pp. 989–1001, figs. 5*).—Practical instructions are offered for planning and economically carrying out field experiments.

Physiological pre-determination experiments with certain economic crops: The relation between rate of germination and subsequent growth, M. A. H. Tincker (*Ann. Appl. Biol., 12 (1925), No. 4, pp. 440–471, pl. 1, fig. 1*).—Experiments conducted at the University College of Wales, Aberystwyth, emphasized the importance of the condition of the seed at the time of sowing.

With oats, the state of maturity was artificially altered by various drying methods, which produced an increased vigor of germination and of subsequent growth. Careful husk removal favored an increased rate of germination and more rapid first-leaf development, this effect being traceable during a long period in the life of the plant. Soaking the seed oats in water also increased the rate of germination and subsequent growth.

Soaking the seed of cocksfoot (orchard grass), timothy, tall and meadow fescue, and rye grass also accelerated germination and stimulated growth to give higher yields of herbage. Results with leguminous seeds varied as to species. While broad bean seeds soaked in water grew more rapidly, little effect was observed on peas, and a deleterious effect was produced by such treatments on dwarf beans and crimson clover. A definite correlation apparently exists between the vigor of germination and the rate of subsequent growth.

Physiological activity of the seminal and nodal roots of crop plants, I. Krassovsky (*Soil Sci., 21 (1926), No. 4, pp. 307–325, pls. 2, figs. 4*).—Investigations with spring wheat, barley, and rye at the Leningrad (Russia) Agricultural Institute showed that the seminal roots are active up to harvest time and supply two or three stems of the plant with nutrients. The correlation between the time of maximum activity of the seminal roots and the maximum growth of the main stem, as well as between the time of the maximum activity of the nodal roots and the maximum growth of the tillers, suggests that the seminal roots supply principally the main stem and the nodal roots the tillers. Removal of the seminal roots during culm formation suppresses the development of the main culm and prolongs the vegetation period. Removal of the nodal roots checks tillering and hastens maturity, but does not affect the quality of the grain of the main stem nor that of the first tiller. While removal of the seminal roots decreases the grain yield, removal of nodal roots

decreases principally the straw yield. Removal of the nodal roots stimulated the growth and activity of the seminal roots, which take up almost twice as much water per unit of dry weight as do the nodal roots.

Do legume leaves hasten the curing process by pumping moisture from the stems? C. J. WILLARD (*Jour. Amer. Soc. Agron., 18 (1926), No. 5, pp. 369–375*).—Experiments made at Ohio State University to determine whether the leaves of plants draw water from the stems during the process of curing into hay gave indications that this occurs with some plants and not with others. Alfalfa stems dried at the same rate whether the leaves were attached or not. Soy bean stems from which the leaves had been cut contained from 3 to 7 per cent more moisture than those dried similarly with the leaves attached. No tendency for the alfalfa leaves to dry the stems was apparent. Soy bean leaves were as efficient in drying the stems when exposed to full August sunlight as when drying occurred in the shade, although drying was much more rapid in the sun.

In practical haymaking the most rapid curing will usually be secured by curing in the swath. Bleaching and loss of leaves by shattering and crumbling, etc., make it desirable to finish the curing of legume hay in the windrow or cock, but this apparently bears no relation to curing the stems by transpiration through the leaves.

The yield of various pasture plants at different periods when harvested as pasturage and as hay, T. K. WOLFE (*Jour. Amer. Soc. Agron., 18 (1926), No. 5, pp. 381–384*).—Orchard grass, Kentucky blue grass, and sheep's fescue were notable among pasture plants in comparative trials at the Virginia Experiment Station. Pasture plants made more luxuriant growth in the cool, moist spring season than in the hot, dry summer season. A mixture of such plants as Kentucky blue grass, orchard grass, redtop, and white clover appeared superior to any of the plants tested when grown alone. The yield of pasturage was from 40 to 65 per cent of the hay.

The geographical distribution of the most important forage species of clover and alfalfa [trans. title], V. A. KUZNETSOV (KOUSNETZOFF) (*Trudy Prikl. Bot. i Selek. (Bul. Appl. Bot. and Plant-Breeding), 16 (1926), No. 1, pp. 55–88, figs. 5*).—A survey of important species pertaining to Trifolium and Medicago showed that these genera are distinctly Mediterranean in area. In most cases, the centers of origin of the separate species must be sought in this region.

Resistance to lodging in barley [trans. title], J. ZÁVADA (*Zemědělský Archiv, 16 (1925), No. 5–6, pp. 237–263, figs. 4; abs. in Ztschr. Pflanzenzücht., 11 (1926), No. 3, pp. 294, 295*).—Consideration of measurements in four lines of Hanna barley on length and diameter of the culms and first and second internodes, the weight, the center of gravity of the culm and other characters concerned in resistance to lodging, as well as data given by the Kraus apparatus, led the author to conclude that neither biometrical calculation, nor the directly determined lodging resistance, nor the relative lodging value reckoned from several factors, would lead to useful results. Resistance to lodging seemed to depend not only on culm resistance but also on culm elasticity, leafage, and other factors.

Tests of strains of red clover from various sources, E. J. DELWICHE (*Jour. Amer. Soc. Agron., 18 (1926), No. 5, pp. 393–403*).—Comparisons with domestic and foreign red clover seed from many sources during 5 years at substations in northern Wisconsin indicated that foreign red clover seed should not be grown in the State. There was some indication that Oregon seed is not adapted to Wisconsin conditions.

Corn production experiments in Delaware, G. L. SCHUSTER (*Delaware Sta. Bul. 146 (1926), pp. 4–27, figs. 9*).—Fertilizer experiments with corn on Sassafras

silt loam during the period 1908–1923 showed the limiting elements in order of significance to be potassium, phosphorus, and nitrogen. Of the materials applied singly, potassium chloride produced the greatest increase in the percentage of sound corn and with lime made further increase in yield and quality. From the viewpoint of yield acid phosphate and potassium chloride seemed the best two-material combination. Corn variously fertilized in a crop rotation made gains ranging from 13.9 to 27.8 bu. per acre over continuous corn similarly treated, and its quality was considerably higher. For best results, the addition of mineral fertilizers or manure or both appears desirable for any crop rotation.

Prolonged varietal trials have indicated the leading white varieties for Delaware to be Johnson County White, Boone County White, and Sussex White; yellow, Reid Yellow Dent, Leaming, Funk Yellow Dent, and Lancaster County Sure Crop; and white cap, One Hundred Day Bristol.

Relation of time of planting corn to the time of silking, denting, and senescence, H. W. ALBERTS (*Jour. Amer. Soc. Agron., 18 (1926), No. 5, pp. 375–380*).—Time of planting tests at the Wisconsin Experiment Station showed that early varieties required less time to reach the silk stage than late sorts. From silking to denting was about 40 days for both early and late varieties and for both early and late plantings in 1925. Late varieties retained green leaves longer after denting than early ones. Leaves of plants from the earliest plantings dried up first.

[Experimental work on cotton, 1923], E. SHEARER ET AL. (*Egypt Min. Agr., Cotton Research Bd. Ann. Rpt., 4 (1923), pp. 1–26, 33–50, 57–105, 139, 140, pls. 4*).—Investigations carried on in 1923 under the Cotton Research Board in Egypt are reported on in detail, in continuation of previous work (E. S. R., 52, p. 136).

A note on the abnormal behaviour of cotton plants when subjected to handling, M. A. BAILEY and J. TEMPLETON (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 61 (1926), pp. [1]+8, pls. 4*).—Handling of cotton plants in counting flowers or measuring growth seemed to result in a stunting effect, produced by reduction in both the number and in the length of internodes. The use of duckboards showed that this effect was not due to trampling the soil. Except in special cases, observations should probably be taken every second or third day.

Studies in Gujarat cottons, Part III, M. L. PATEL and D. P. MANKAD (*India Dept. Agr. Mem., Bot. Ser., 14 (1926), No. 2, pp. [3]+59–112, pls. 3, figs. 7*).—The third part of this series (E. S. R., 51, p. 339) sets forth the history, characteristics, and producing districts of the Wagad cotton (*Gossypium herbaceum*), reports on the inheritance and variation of certain plant, boll, seed, and lint characters from extensive studies, and indicates correlations determined between several characters. The ideal plant and certain pure lines are described briefly.

The nodule organism of the cowpea group, T. E. RICHMOND (*Jour. Amer. Soc. Agron., 18 (1926), No. 5, pp. 411–414*).—Studies at the Illinois Experiment Station (E. S. R., 54, p. 329) in which certain legumes were found to belong to the soy bean group in inoculation are reported in some detail.

Relation of the seed coat of feterita to the rate of water absorption and germination, A. F. SWANSON (*Jour. Amer. Soc. Agron., 18 (1926), No. 5, pp. 428–432, fig. 1*).—Comparative tests at the Hays (Kans.) Substation showed that water was absorbed more rapidly by feterita and Kansas Orange sorgo, which have soft seed coats, than by Blackhull kafir and Red Amber sorgo, having hard, glossy seed coats. Water was absorbed fastest during the first two

hours of soaking. The hard, glossy seed coat apparently retards water absorption, but the hyaline layer did not seem to be a factor. The greater number of mesoderm cells in the feterita seed may account for its absorbing water more rapidly than Blackhull kafir and Red Amber.

Germination tests showed that feterita will germinate more rapidly than either corn or wheat and at a lower moisture content. The ability of feterita to germinate in a comparatively dry seed bed is indicated as a reason for its adaptability in dry regions. When planted in a cold, wet seed bed, however, the seed often rots, and a poor stand results because of the effect of excess moisture.

The effect of varying the nitrogen supply on the ratios between the tops and roots in flax, T. W. Turner (*Soil Sci., 21 (1926), No. 4, pp. 303–306*).—According to results obtained at Hampton Institute, the tops of flax can not profit by an increased supply of nitrates beyond a certain low limit. The smallest quantity of nitrates used was as effective in causing a change in the top growth: root growth ratio as a quantity 20 times as large.

Flax in Wisconsin, A. H. Wright (*Wis. Agr. Col. Ext. Circ. 203 (1926), pp. 16, figs. 2*).—This account of seed flax culture in the State outlines cultural methods and harvesting practices and indicates the merits of flax-grain mixtures from results obtained at the Wisconsin Experiment Station.

Flax culture in Argentina [trans. title], C. D. Girola (*Mus. Agr. Soc. Rural Argentina, Pub. 45 [1925], pp. 8, figs. 8*).—The status of seed flax production in Argentina (E. S. R., 43, p. 436) is described, and the characteristics of flax seed samples are tabulated. The author indicates that the industry may be expanded considerably through improved agricultural practices.

Kapok (*Bul. Imp. Inst. [London], 24 (1926), No. 1, pp. 18–36*).—A survey of kapok production within the British Empire is presented, with notes on its cultivation and uses.

Hastening the sprouting of dormant potato tubers, F. E. Denny (*Amer. Jour. Bot., 13 (1926), No. 2, pp. 118–125, pls. 2*).—To find a method of hastening the germination of dormant potato tubers, both cut and whole tubers were either soaked, usually for one hour, in aqueous solutions of different chemicals of gradually increasing concentrations or exposed for varying periods in closed containers to vapors from numerous volatile compounds at the Boyce Thompson Institute for Plant Research.

The vapors of ethylene chlorohydrin were found remarkably effective in causing prompt germination of dormant potatoes. With Irish Cobbler, 1925 Long Island crop, the treated lot produced vines 2 ft. high, bearing second-crop tubers 1 cm. in diameter before the checks appeared above ground. Sodium and potassium thiocyanate solutions also gave excellent results in forcing early sprouting, and favorable results were had with dichloroethylene, trichloroethylene, carbon disulphide, ethylene dichloride, xylol, and ethyl bromide. Results with ethylene were unsatisfactory.

Solutions of thiourea in proper concentration not only forced prompt sprouting but consistently caused the development of more than one sprout per eye, sometimes as many as eight, and induced the development of more than one eye on each potato. It thus overcame the inhibiting effect which the main bud in each eye exerts upon the subsidiary buds, and also partially nullified the capacity of the terminal bud to prevent the development of basal buds on the same seed piece.

Second report on the use of chemicals for hastening the sprouting of dormant potato tubers, F. E. Denny (*Amer. Jour. Bot., 13 (1926), No. 6, pp. 386–396, pls. 4*).—Further studies gave general confirmation of the results described above, although ethylene chlorohydrin was less effective against Irish

Cobbler in the early stages of dormancy, possibly due to the immaturity of the tubers at digging. Ammonium thiocyanate, ethyl iodide, and o-tolyl-thiourea were found effective in hastening sprouting.

After whole tubers had been treated by the vapor method it was found unnecessary to plant them at once, the favorable effects remaining for at least 3 weeks after treatment. Tubers possibly could be treated where they are grown and shipped to a distant locality for planting. Storage of whole tubers in air after treatment before planting also helped to avoid the toxicity of the chemicals. Tubers treated with certain concentrations of ethylene chlorohydrin, when cut into pieces and planted at once, often rotted, whereas samples of the same lot held in air a few days after treatment before cutting and planting did not rot but showed early sprouting with healthy sprouts. Recommendations based on experience obtained in both series of tests are given for forcing the sprouting of tubers of Bliss Triumph, Irish Cobbler, Green Mountain, and McCormick.

Size of seed potatoes and yields [trans. title], CLAUSEN (*Illus. Landw. Ztg.*, *46* (*1926*), *No. 11*, *pp. 137*, *138*).—Experiments involving several potato varieties and variously fertilized soils showed noticeable yield increases to accompany an increase in the weight of seed tubers. The use of the heavier seed appeared to pay better with early than with late varieties. The yield increase was somewhat smaller where medium to large-sized tubers were already being used for seed. Heavy seed seemed relatively more important on unfertilized than on well fertilized land.

Some pollination and cytological studies of sweet clover, A. T. ELDERS (*Sci. Agr.*, *6* (*1926*), *No. 10*, *pp. 360–365*, *figs. 2*).—Pollination studies with *Melilotus alba*, *M. alba annua*, and *M. officinalis* dealt with seed setting in racemes inclosed with and without bees in tarlatan cages and open-pollinated during the summers of 1923 and 1924 at the Manitoba Agricultural College and during the 1925 summer with seed setting in flowers open-pollinated and inclosed in parchment paper bags at the Minnesota Experiment Station.

White sweet clover set seed readily in both tests, and the general similarity of all plants of a family, whether from selfed or open-pollinated seed, together with the high seed setting of inclosed racemes, suggests that ordinarily this species is highly self-pollinated. Hubam sweet clover behaved similarly to white sweet clover and also ordinarily appears to be highly self-fertilized.

Yellow sweet clover set very few seeds when insect visitation was controlled in Manitoba, and in Minnesota only 3 of 50 plants with inclosed racemes set one pod each, while open-pollinated checks on the same plants averaged 27.35 seeds per raceme. Plants in families from open-pollinated seed were not generally so uniform as those in white sweet clover families, indicating that yellow sweet clover is either somewhat self-sterile or, as Kirchner (E. S. R., 17, p. 957) suggests, is very sensitive to inclosure in nets.

Counts showed 16 chromosomes (diploid) for *M. alba*, *M. alba annua*, and *M. officinalis*, and 32 chromosomes (diploid) for alfalfa, *Medicago sativa*.

A comparison of sweet clover types with respect to coumarin content, nutritive value, and leaf percentage, L. E. KIRK (*Jour. Amer. Soc. Agron.*, *18* (*1926*), *No. 5*, *pp. 385–392*).—The comparative yields of cured hay and the percentages of leaf, dry matter, protein, carbohydrates, ether extract, ash, fiber, and coumarin are tabulated for three cuttings from eight strains of sweet clover, representing five distinct types grown at the University of Saskatchewan.

Further notes on the flowers and seeds of sweet potatoes, A. B. STOUT (*Jour. N. Y. Bot. Gard.*, *27* (*1926*), *No. 318*, *pp. 129–135*, *fig. 1*).—Additional information, together with that recorded earlier (E. S. R., 53, p. 838), indicates that during the period of maximum blooming the type of sterility operating in

sweet potatoes is that of incompatibility in the processes of fertilization. Most seedlings and most clonal varieties appear to be completely self-incompatible.

Investigations on tobacco, with special reference to quality, H. M. STEECE (*U. S. Dept. Agr., Off. Expt. Stas., Rpt. Agr. Expt. Stas., 1925, pp. 81–93*).—Investigations at the State experiment stations, often in cooperation with the U. S. Department of Agriculture, concerned with either the improvement of quality or the increase of yield of tobacco are reviewed under the topics of climate, soils, fertilizers, rotations and cover crops, breeding, spacing and topping, harvest, shading, diseases, curing, fermentation, composition, nicotine, *Nicotiana rustica*, burning quality, and grain. Ninety-eight references are cited.

[Fertilizer experiments with tobacco], A. N. J. BEETS (*Proefsta. Vorstenland. Tabak [Dutch East Indies], Meded. 54 (1926), pp. 109, figs. 3*).—Fertilizer tests (E. S. R., 52, p. 736) included trials of nitrogenous and phosphatic salts on seed beds and in the field, losses of fertilizers from the soil, and time and methods of applying fertilizers to tobacco.

Tobacco culture in Mexico [trans. title], L. MARIN (*Tropenpflanzer, 29 (1926), No. 3, pp. 109–119*).—Environmental conditions and cultural, field, and harvesting practices in the producing districts in Chiapas, Oaxaca, Vera Cruz, and Tobasco are described, and important insects and diseases listed.

[Tobacco experiments in the Dutch East Indies], A. N. J. BEETS (*Proefsta. Vorstenland. Tabak [Dutch East Indies], Meded. 53 [1925], pp. 49–88*).—The effects on quality of products of harvesting tobacco leaves at different maturity stages, of shading, and of topping are reported on.

A statistical study of the characters of wheat varieties influencing yield, C. H. GOULDEN and A. T. ELDERS (*Sci. Agr., 6 (1926), No. 10, pp. 337–345, figs. 6*).—The relationships between yield, percentage of stem rust and of leaf rust, days from seeding to heading, and strength of straw, considered as characters of wheat varieties, were studied by statistical methods involving the calculation of the correlation coefficients of zero and third order, and of the correlation ratios. The data were collected during 1925 on 146 wheat varieties grown at Winnipeg, Manitoba.

Definite evidence of negative correlation between yield and susceptibility to stem rust, days from seeding to heading, and strength of straw was obtained. The first of these relationships appeared to be chiefly responsible for the other two. Yield and susceptibility to leaf rust seemed to be related negatively.

Wheat varieties in Washington, E. G. SCHAFER, E. F. GAINES, and O. E. BARBEE (*Washington Col. Sta. Bul. 207 (1926), pp. 4–31, figs. 10*).—Supplementing previous work (E. S. R., 45, p. 436), this publication describes and classifies the principal wheat varieties grown in Washington and indicates their distribution, yields, and adapted areas, and presents the results of rate and date of seeding tests. Milling and baking data are given for 32 sorts.

Of the older commonly grown varieties, Triplet, Hybrid 128, and Turkey made the best average yields of the winter wheats, and Jenkin and Bluestem led the spring-sown varieties. A comparison of fall and spring seedings of 9 spring varieties showed that certain spring wheats like Hybrid 123 produce more from fall sowing, while others do best from spring sowing. No true spring wheat was found to yield as high from fall sowing as the standard winter wheats. Seeding tests during 9 years indicated the largest yields are obtained by seeding Hybrid 128 or Red Russian from August 16 to October 16, the best date varying in different years. The sowing date giving the greatest yield averaged somewhat earlier than the date resulting in the most smut.

Relation of protein content to baking quality of flour from hard red spring and durum wheats, C E. MANGELS (*Cereal Chem., 3 (1926), No. 3, pp.*

150–157, fig. 1).—In studies at the North Dakota Experiment Station a significant positive correlation was found between the protein content and baking strength (as measured by loaf volume) of hard red spring wheat flour for 8 of 11 crop years. The magnitude of the coefficient of correlation indicated that protein content is not the sole factor determining the baking strength of hard red spring wheat flours, gluten quality and the diastatic activity of the flour also being important. Durum wheat flours consistently averaged lower in loaf volume than hard red spring wheat flours. A positive correlation larger than +0.3 was found between protein content and baking strength of durum wheat flours for 6 of 10 crop years. The relatively low baking quality of durum wheats seemed evidently due to poor quality of gluten.

Effect of sodium nitrate applied at different stages of growth of wheat on the baking quality of the flour, J. Davidson and J. H. Shollenberger (*Cereal Chem., 3 (1926), No. 3, pp. 137–143, figs. 2*).—Recent experiments by the U. S. Department of Agriculture have shown that even under conditions when an application of sodium nitrate at the vegetative stage does not increase the yield of wheat, the protein content of the grain is very materially increased when the application is made at the time of heading. The nitrogen increment of such wheat is distributed among the flour, shorts, and bran. The yields and composition of grain were similar whether the wheat was seeded in 8- or 24-in. drills. Practically all the measurements and scorings used in testing the quality of bread favored the wheat from plats receiving applications of sodium nitrate at the time of heading.

Baking qualities of Mesopotamian (Iraq) wheat, II (*Bul. Imp. Inst. [London], 24 (1926), No. 1, pp. 14–17*).—Additional tests (E. S. R., 52, p. 835) by J. Kirkland are described.

A new United States weed: Hymenophysa pubescens, P. C. Standley (*Science, 62 (1925), No. 1614, pp. 509, 510*).—The occurrence of the above perennial is recorded at Pocatello, Idaho. This weed is strongly suggestive of *Lepidium draba* in general appearance and habit and is a native of the Altai region of central Asia.

Eradication of annual and perennial weeds [trans. title], C. D. Girola (*Min. Agr. [Argentina], Secc. Propaganda e Informes Circ. 311 (1924), pp. 14, figs. 8*).—Control methods are outlined for conditions in Argentina, with a list of about 120 of the most common weeds of fields and pastures in that country.

HORTICULTURE

[Horticultural investigations at the Florida Station], R. W. Ruprecht, H. Mowry, and G. H. Blackmon (*Florida Sta. Rpt. 1925, pp. 32–35, 65–76, figs. 3*).—Yield data taken on grapefruit trees in the qualitative phosphorus fertilizer study at Lake Alfred showed small increases in favor of the soft phosphate plats. Contrary to the preceding year's results (E. S. R., 54, p. 334), no well-defined differences were found between the high and low potash treatment for citrus trees. In a comparison of ammonium sulfate, nitrate of soda, and blood as sources of ammonia for grapefruit trees, there were found no conspicuous differences.

Work with the tung-oil tree indicated that the tendency to produce more than one fruit per twig is probably transmissible through budding or grafting. A tendency for the tree to grow long vertical shoots was partly overcome by the removal in early spring of a narrow section of bark directly above a bud, thereby inducing development. *Aleurites fordi* buds were successfully inserted in *A. montana* trees. Counts showed from 340 to 450 unhulled, dried tung-oil fruits per bushel from different trees. The average bushel contained 17 lbs

10 oz. of seeds. Viability tests showed that tung-oil seed must be planted the season following maturity. Results of variety tests with miscellaneous tree and small fruits are reported.

Tests showed that rough lemons may be propagated from leaves placed in potting soil in a solar frame. Quihou privet showed no root knot after two years in a light sandy soil.

Measurements taken upon Schley, Success, and Curtis pecan nuts during their development showed that the nuts on the younger trees are more affected by environmental changes than are those on the older ones. The maximum growth occurred from June 15 to August 15. Approximately 27 varieties of pecans are under observation.

[Horticultural investigations at the New Hampshire Station] (*New Hampshire Sta. Bul. 221 (1926), pp. 19–23, 24–32, 33*).—A progress report for the calendar year 1925 (E. S. R., 53, p. 437).

Comparisons made by G. F. Potter and S. W. Wentworth of records taken during the 7-year period 1919–1925 on the yield and growth in a Baldwin orchard with data for the preceding 10-year period, 1909–1918, showed that trees in sod have steadily declined in vigor and yield, those in culture with and without cover crop have about held their own, and those in cultivated, cover-cropped, and fertilized areas have increased in vigor and yield. Fertilized trees not only returned an actual profit on the added fertilizer, but also are in a thrifty, vigorous condition, forecasting many years of future productivity. Of three fertilizer plats receiving extra phosphoric acid, nitrogen, and potash, respectively, the extra nitrogen plat was the only one to show a decided gain in yield and general appearance, suggesting that nitrogen is probably the only ingredient of value to the apple tree.

In continuing the project on the relation of the composition of fruit spurs to fruit-bud formation (E. S. R., 54, p. 837), it was decided to limit the study in the future to new growth of nonfruiting spurs. Progress in apple variety tests, conducted by Potter and Wentworth, is briefly noted. Of three types of pruning, namely, vase, semileader, and full leader, employed by Potter in shaping Northern Spy and McIntosh trees, none was outstanding as measured in diameter increment.

A full crop of fruit in 1925 gave opportunity to measure the effects of differential fertilizer treatments in a peach orchard. Nitrogen alone, in the form of nitrate of soda or in combination with other ingredients, gave substantial increases above the checks, and some evidence was obtained to suggest that muriate of potash used with nitrogen further increased yields. Acid phosphate apparently exerted a reducing effect upon yields.

As reported by O. H. Pearson, sucrose steadily increased in stored celery up to the close of the storage period, December 8. As reducing sugars increased only during the first two weeks, it is believed that the constantly improving quality of stored celery is due primarily to sucrose. The material increase in the percentage of nitrogen in the inner portion of the plant is thought due to translocation from the outer leaves rather than absorption from the soil in the storage pit. Attempts to correlate the presence of the glucoside apiin with flavor were fruitless. Anatomical studies indicated that celery strings consist of relatively hard, woody xylem cells in the fibrovascular bundles.

Studies by J. R. Hepler upon the effect of acid phosphate on squash showed a distinct stimulation to vine growth, starting early and continuing throughout the season. Although acid phosphate uniformly increased yields, the maximum yields were obtained on a plat receiving 40 tons per acre of animal manure. Correlation of squash yields with growth on July 22 showed coeffi-

cients of 0.239±0.088 as compared with 0.966±0.009 recorded for tomatoes in 1924. Thinning squash to one plant per hill reduced total yields but increased the size of individual fruits.

Records by Hepler of yields of spinach planted in April on the permanent soil fertility plats showed that heavy fertilization is needed for this crop. Except upon heavily manured plats, the absence of lime greatly reduced yields. Danish cabbage following spinach also responded to high fertility, but was not so seriously affected by the absence of lime. The average increase in cabbage yields due to lime was 16.6 per cent as compared to 75.5 per cent for spinach.

Data taken by Hepler upon a number of standard tomato varieties to determine whether early ripening in early varieties is due to early growth and early production of blossom clusters or to a rapid rate of ripening after fruit setting showed that the earlier varieties grow more rapidly in the early part of the season and produce their clusters earlier than do the late varieties. Yield data recorded on 12 varieties of tomatoes showed that the early and medium season kinds are the only ones to ripen a profitable amount of fruit.

A strawberry bed planted in the spring of 1924 to test the value of various fertilizer ingredients suffered severe winter injury, but yielded sufficient fruit to show that hen manure at the rate of 1,000 lbs. per acre was the only treatment to give a significant increase in yield.

Report of the division of horticulture, W. T. MACOUN ET AL. (*Canada Expt. Farms, Div. Hort. Rpt. 1924, pp. 51, figs. 15*).—In fertilizer studies with the Parson Beauty strawberry, large applications of nitrate of soda either on May 3 or just before bloom (June 4) failed to cause any general suppression or reduction in the number of blossoms per plant. However, in a detailed analysis of records, it was found that the flower production of the older plants was reduced and that of the younger plants increased by the nitrate applications, indicating the necessity of knowing the age of experimental material. In respect to the set of berries, there was a slight increase on nitrated plants, due primarily to the effect on the secondary blossoms. The stimulating effect of nitrate was much more pronounced in the younger plants. Records taken upon individual fruits showed that spring applications of nitrate of soda tended to slightly increase the weight and size of the earlier maturing berries. In applying nitrate of soda to strawberries at various seasons, it was found that nitrogen was apparently not a limiting factor on the soil used in the test. Nitrate applied to newly set plants frequently injured them.

Of 2,838 apple blossoms from which the petals and the nectar cups had been removed prior to opening, only 4 set fruit, indicating that bagging of bloom is not important in pollination studies. Records taken in the fall of 1924 showed that the apple pollen tubes did not grow as rapidly as in the preceding season, when from 38 to 48 hours sufficed for the tube to reach the base of the style. Cold winds are considered to have been the limiting factor. Observations upon apple blossoms pollinated immediately following emasculation and on succeeding days showed that early pollination is best, the records of the percentage set being 41.6, 45.5, 17.9, 7.4, 2.7, and 4.4 for the first to the sixth day, respectively. The results of applying Crimson Beauty pollen to emasculated Duchess buds in different stages of development showed in almost every case that large buds give the greatest set. Pollen from large buds gave higher germination and longer pollen tubes than that from smaller buds. Observations on seven apple varieties showed a range of from 3 to 5 days for the period in which blossoms open. The maximum period of receptivity of any single blossom was from 2 to 3 days. The results of tests of intercompatibility in apple blossoms are presented in tabular form. The variable results secured

from year to year and from tree to tree of a single variety led to the suggestion that pollination records should be taken on healthy, productive trees in their bearing year. Since glycerin-coated slides placed in apple trees in full blossom failed in most cases to collect enough pollen to insure fertilization, it is concluded that wind alone is not sufficient to insure satisfactory fruit setting.

Four newly named apple seedlings are described, and notes are given on the progress of nursery tree certification by leaf analysis. A list of raspberry varieties graded according to their susceptibility to mosaic is included, and mention is made of an attempt to cultivate the blueberry.

A test of over 3,000 lots of vegetable seed for trueness to name showed great confusion, the range in purity being, in 1923, from 27 per cent for carrots to 87 per cent for garden peas. Breeding experiments for sweet corn and tomatoes have resulted in the development of several quick maturing varieties adapted to Canada. Extensive varietal and cultural tests are reported with tomato, cabbage, garden peas, etc. With careful roguing it was found possible to maintain certified seed potato stock in a productive condition the second season.

Notes are presented on the behavior of a large number of conifers in an ornamental planting at Ottawa. Iris and lily varieties found desirable in extensive tests are enumerated. An attempt to grow head lettuce in the greenhouse showed that the early Paris Market variety can be grown successfully.

Most of the data relating to fruit was prepared by M. B. Davis, that relating to vegetables by T. F. Ritchie, and an article on lilies was written by I. Preston.

Plants from seed, A. J. Macself (*London: Thornton Butterworth Ltd., 1926, pp. 239, pls. 12, figs. 12*).—Practical information is offered on the planting of seeds and the treatment of young seedlings of various flowering and vegetable plants.

Effect of size of seed on plant production, F. Kotowski (*Acta Soc. Bot. Polon., 3 (1926), No. 2, pp. 253–276, figs. 6*).—Biometrical studies at the Institute of Olericulture and Vegetable Breeding, at Warsaw, upon the relative value of large and small seeds in the production of Brunswick short-stem cabbage showed no permanent effect of seed size on the resulting plants. A marked influence was noted in the seedling stage, and at 60 days plants from large seed were more than twice the weight of plants from small seed, indicating to the author a dependence of the seedling upon the nutrients contained within the seed. The effect of the size of the seed disappeared, however, so that yields from small seed were as high as those from large seed. The small seed yielded harder heads and a higher percentage of marketable heads than the large seed. Increased soil fertility diminished the variability of seedling characters and gave a higher correlation between the various plant characters.

Concerning the effect of fruit upon seed maturity in the pepper, eggplant, and cucumber [trans. title], H. Kosaka (*Jour. Dept. Agr., Kyushu Imp. Univ., 1 (1925), No. 5, pp. 197–216; abs. in Japan. Jour. Bot., 3 (1926), No. 1, p. 11*).—A determination of the viability and dry weight of seeds extracted from peppers, eggplants, and cucumbers at different stages of maturity showed definite increases with advancing maturity. These increases were evident in both harvested fruits and in those allowed to remain upon the vines, and are believed by the author to be due to a transfer of nutrients from the flesh of the fruit to the seed.

On the structure of some ancient, but still viable fruits of Indian lotus, with special reference to their prolonged dormancy, I. OHGA (*Japan. Jour. Bot., 3 (1926), No. 1, pp. 1-20, pl. 1, figs. 3*).—Herein are presented the results of a microscopic study started at the Educational College at Dairen, Manchuria, and continued at the University of Tokyo and Johns Hopkins University, of exhumed fruits of the Indian lotus (*Nelumbo nucifera* Gaertn.).

Despite burial in peat for an estimated period of from 300 to 400 years, the fruit was found viable when treated with acids or mechanically abraded. Examination showed that the fruit had lost its epidermis, leaving exposed a layer of palisade cells sufficiently resistant to withstand immersion for 24 hours in concentrated sulfuric acid without the inclosed embryo being killed. Of four chemicals, namely, concentrated sulfuric acid, 50 per cent chromic acid, concentrated nitric acid, and concentrated potassium hydrate, found capable of dissolving the palisade cells, the sulfuric acid was most satisfactory. A definite relation was noted between the time that fruits were immersed in sulfuric acid and the time required for the swelling of the embryo, and the time required for the beginning of swelling was inversely proportional to the duration of the immersion.

In summing up, the author states that the longevity of the Nelumbo fruits used in the study was due in part to their peculiar seed coat and in part to the deep covering of soil. The anatomical structure of the seed coat is discussed in detail.

Some factors influencing quality in sweet corn, I. C. HOFFMAN (*Canner, 63 (1926), No. 1, pp. 23-27, figs. 4*).—A contribution from the Indiana Experiment Station, discussing briefly the influence of temperature, time of planting, stage of maturity, size of the seed kernels, etc., upon the quality of canning sweet corn.

The improvement of tomatoes by selection, J. W. LESLEY and J. T. ROSA (*Hilgardia [California Sta.], 2 (1926), No. 2, pp. 25-45, figs. 9*).—The Santa Clara Canner tomato, an important canning variety in California, is characterized by large size, irregular shape, and roughness. In an attempt to improve this variety seed was saved from single plants in various commercial fields. The fruit of these selections differed from the regular variety in a lesser proportion of fruits showing certain defects such as roughness at the stylar and stem ends. In respect to resistance to Fusarium wilt, some of the selected lines were inferior, others equal, and a few apparently superior to the regular Santa Clara Canner. In fruit shape, content of total solids, and scarcity of seed, some of the selections gave promise of having unusual canning value. The Santa Clara Canner as generally grown is believed to be a highly heterogenous variety, capable of splitting into a number of distinct lines.

Progress of fruit breeding, G. T. SPINKS (*Jour. Bath and West and South. Counties Soc., 5. ser., 20 (1925-26), pp. 187-190*).—A brief report upon activities at the Long Ashton Research Station, embracing work with apples, pears, plums, black currants, gooseberries, raspberries, blackberries, strawberries, etc. The F_2 plants of a cross between Himalaya and an autumn-fruiting raspberry contained some promising individuals which have been crossed with raspberries, loganberries, and blackberries in the hope of developing new types of small fruits.

[Physiological activity in the Ben Davis apple and other studies], R. P. HIBBARD (*Michigan Sta. Rpt. 1925, pp. 209, 210*).—With the exception of acid phosphate plats, the rate of carbohydrate synthesis per unit area of leaves was greater on fertilized than control plats. The rate of carbohydrate utilization was increased in a like manner. Of the various fertilizer materials, nitrate of

soda was the most effective. Fertilizer applications stimulated carbohydrate accumulation in the autumn. Osmotic pressure readings showed greater variations and higher pressure in leaves than in fruits. Work with frost protectors (E. S. R., 55, p. 38) and in bean germination (E. S. R., 54, p. 443) is again discussed.

The effects of leaching with cold water on the foliage of the apple, C. E. T. MANN and T. WALLACE (*Jour. Bath and West and South. Counties Soc., 5. ser., 20 (1925-26), pp. 215-223, fig. 1*).—The occurrence in 1924 at the Long Ashton Research Station of a severe spotting of the leaves of several apple varieties was believed to be due to the abnormal rainfall of that season. The immersion for one hour in cold distilled water, followed by exposure to the open air, of the leaves of the Cox Orange Pippin, the most susceptible variety, induced a similar appearance, while at the same time the water became slightly colored, indicating the leaching of some compound from the leaves. Chemical analyses of the water and of a solution of crushed leaves indicated that potassium compounds were lost by leaching.

The Endicott pear tree, W. C. ENDICOTT (In *Memoir of Samuel Endicott. Boston [Danvers, Mass.: Author], 1924, pp. 177-188, pls. 4, fig. 1*).—A brief account of a pear tree living in 1924 which is believed to have been planted by Gov. John Endecott at Salem, Mass., about 1630.

Instability in peach varieties, G. P. WELDON (*Jour. Heredity, 17 (1926), No. 4, pp. 133-135, figs. 2*).—Again discussing the subject of mutations in the peach (E. S. R., 51, p. 227), the author cites the discovery of another mutant form of the Ontario variety. The fruit resembles the parent in color, but differs sharply in shape and quality. On account of its vigorous growth, the mutant form is deemed likely material for propagation and hence a source of inferior stock. Trees propagated from this aberrant form bore the same type of fruit.

The cherry in Ontario (*Ontario Dept. Agr. Bul. 316 (1926), pp. 24, figs. 9*).—General information is offered on culture, propagation, varieties, harvesting, etc.

The black currant, J. VERCIER (*Le Cassis. Paris: Libr. Agr. Maison Rustique, [1925], 4. ed., pp. VII+153, figs. 27*).—Stating that approximately 30,800,000 lbs. of black currants were produced in France in 1926, the fruit being extensively used in the production of fermented and unfermented juice, dried currants, and jam, the author discusses varieties, culture, propagation, pruning, harvesting, marketing, and manufacture.

Currants and gooseberries, E. F. PALMER (*Ontario Dept. Agr. Bul. 318 (1926), pp. 23, figs. 10*).—A comprehensive discussion upon currant and gooseberry production in Ontario, considering such points as botanical relationships, propagation, culture, harvesting, varieties, etc. Included with the principal paper are two supplementary contributions, (1) The More Important Diseases of Currants and Gooseberries, by J. E. Howitt (pp. 17-19), and (2) The Chief Insect Pests of Currants and Gooseberries, by L. Caesar (pp. 20-23).

A note on strawberry "strains," E. BALL (*Jour. Bath and West and South. Counties Soc., 5. ser., 20 (1925-26), pp. 200-204*).—Yield records taken at the Long Ashton Research Station upon progeny plants of six strains of Royal Sovereign strawberry obtained from different sources showed marked differences, the best strain bearing nearly 50 per cent more fruit than the poorest strain. The strains also differed largely in respect to the size and vigor of the plants. Runner plants taken from parents allowed to produce only three offspring produced much more fruit than progeny of parents unrestricted in runner formation.

Jujubes in Texas, W. B. Lanham (*Texas Sta. Circ. 41 (1925), pp. 28, figs. 14*).—Briefly describing the tree, foliage, flower, and fruits, the author discusses soil requirements, climatic adaptations, planting, culture, pruning, propagation, varieties, and methods of utilization.

Some preliminary notes on persimmons in Kwangtung, F. A. McClure (*Lingnaam Agr. Rev., 3 (1926), No. 2, pp. 91–98, pls. 10*).—Notes on culture, varieties, methods of harvesting, and curing are presented. Two practices, (1) immersion in lime water for a few days and (2) a sweating process, are described and reported as being successfully employed in bringing the persimmons to an edible condition.

Cactus, E. Schelle (*Kakteen. Tübingen, Germany: Alexander Fischer, 1926, pp. [3]+368, pls. 68, fig. 1*).—This handbook consists for the most part of brief descriptions of the various forms and species of cactuses found in commerce.

Pollination of the avocado, T. R. Robinson and E. M. Savage (*U. S. Dept. Agr., Dept. Circ. 387 (1926), pp. 16, pl. 1, figs. 5*).—As outlined in an earlier paper by Stout (E. S. R., 50, p. 238), the individual flowers of all avocado varieties have two distinct periods of opening, in the first of which the pistil is receptive, and in the second the anthers dehisce. Furthermore, varieties may be divided into two groups, those in a receptive stage in the morning and those in a receptive stage in the afternoon. In planting it is important to mix varieties of these two groups so as to insure adequate pollination. Varieties growing at Homestead, Fla., are classified in their respective groups. Information concerning varietal compatibilities is still meager, but sufficient to indicate that solid plantings of a single variety or of varieties all in one class are decidedly inadvisable. Protogyny as observed in the avocado practically prohibits self-fertilization, for the stigma is usually past the receptive condition at the second floral opening.

Citrus culture in central California, G. J. Surr and L. D. Batchelor (*California Sta. Bul. 405 (1926), pp. 3–23, figs. 5*).—Field studies conducted from 1919 to 1924 on adobe soils in Tulare County showed a marked response to nitrogenous fertilizers in spite of the relatively fertile nature of the soil. Of seven cultural treatments used in a Washington Navel orchard at Lemoncove, clean culture in summer followed by a legume cover crop in winter proved to be the most effective practice. Summer cover crops were not successful, probably because of their use of available nitrates, which were found very low at times in this area. Alfalfa proved to be a poor intercrop, injuriously affecting the trees.

In similar studies at Porterville the beneficial effect of fertilizers was less marked, due probably to lack of irrigation water. The use of alfalfa as an intercrop again proved distinctly deleterious. Based on the results of these tests and upon observations in commercial groves, the authors suggest soil management practices for citrus orchards.

An attempt to reduce the June drop of citrus fruits by inclosing trees in tents, with a view to increasing the moisture content of the air, gave negative results. With adequate fertility and irrigation June drop is not considered a serious problem. Because of the greater resistance to disease, it is advised that sour orange roots be used in establishing citrus plantations on adobe or other heavy soils. Water logging is considered a cause of root-rot injury and hence should be avoided where possible.

Dutch and French bulb culture in Florida, also diversified farming, G. M. Randall (*De Land, Fla.: E. O. Painter Ptg. Co., 1926, pp. 96, pls. 19*).—Cultural and varietal information applicable to Florida conditions is presented.

Sweet peas: Their history, development, culture, C. W. J. UNWIN (*Cambridge: W. Heffer & Sons, 1926, pp. XI+197, pls. 14, figs. 4*).—Information is offered on the outdoor and indoor culture of sweet peas, with notes on varieties and hybridization.

The capsules, seed, and seedlings of the tiger lily, Lilium tigrinum, A. B. STOUT (*N. Y. Bot. Gard. Contrib. 281 (1926), pp. 269–278, figs. 4*).—Despite the fact that the flowers of the tiger lily, excepting those of the double form, are perfect, both in respect to pistil and pollen, there is no record of seed ever having been produced by this species. Reproduction is in the form of bulblets produced in the axils of the leaves or by division of the parent bulb. In pollination studies at the New York Botanical Garden, tiger lilies yielded capsules and viable seed in crosses with four different lilies, namely, *Lilium maximowiczii*, *L. sutchuenense*, *L. leichtlinii*, and *L. davuricum wallacei*. No success was had with pollen of *L. auratum*, *L. canadense*, *L. candidum*, *L. calcedonicum*, varieties of *L. davuricum*, *L. henryi*, *L. speciosum*, *L. superbum*, and others. Since the tiger lily does not reproduce from seed, the author suggests the probability that it is not a distinct species but simply a clonal variety.

Garden-making, E. REHMANN (*Boston: Houghton Mifflin Co., 1926, pp. XXVIII+208, pls. 47*).—Abundantly illustrated with views from actual gardens, this book presents information on the planting, care, and utilization of various garden plants.

Garden making and keeping, H. FINDLAY (*Garden City, N. Y.: Doubleday, Page & Co., 1926, pp. XVIII+252, pls. 24, figs. 52*).—General information is presented upon the planning, planting, and care of ornamental gardens.

FORESTRY

Some relations of plant ecology to silvicultural practice, C. G. BATES (*Ecology, 7 (1926), No. 4, pp. 469–480*).—A general discussion pointing out that careful investigations of each forest species response, especially in the seedling stage, to changes in various environmental conditions, such as soil moisture, soil temperature, light, etc., would prevent fruitless effort and greatly aid in the quick establishment of desirable species. Definite instances are cited where this lack of fundamental information has resulted in the abandonment of costly projects.

Influence of biological factors upon forest growth [trans. title], D. FEHÉR and I. VÁGI (S. VÁGI) (*Erdészeti Kisérletek, 28 (1926), No. 1–2, pp. 27–68, 105–113, figs. 2*).—In studies at the Royal Hungarian Institute for Mountain and Forest Engineering in Sopron it was found that the carbon dioxide concentration of the air invariably was higher in forest stands than in the open. Above soil level the concentration diminished rapidly until at 6.5 ft. it practically equaled that of normal air. Hence it is concluded that only young growth could benefit from this higher concentration. Light intensity beneath dense canopies showed very low values, averaging from 2 to 15 per cent of open exposure, and only in row-planted acacias reached 27.5 per cent.

Various forest species, including *Pinus silvestris*, *Picea excelsa*, *Fagus silvatica*, *Betula alba*, and *Quercus pedunculata*, showed much less susceptibility to soil acidity than the agricultural plants, suggesting that acidity relations are much less important in forestry than in agriculture. The number of bacteria decreased with increased acidity, diminishing very rapidly when the pH value went below 4. The carbon dioxide content of the air lying directly above the soil was immediately related to the activity of the soil bacteria. The lowest pH value found was in dense stands of middle aged conifers and the highest in

thin broadleaf stands, especially acacias. The introduction of broadleaf species raised the pH value in coniferous forests. No direct relation was found between acidity and the geological structure of the soil. Light intensity also affected acidity, but the harmful effects of dense canopies were often offset by the greater activity of the soil flora. Water and air reached their lowest value in dense stands. Based on the results of the study, the authors recommend that conifer forests be either inter- or under-planted with deciduous species.

A German summary (pp. 105–113) is included.

Notes on artificial regeneration in north India, S. H. Howard (*Indian Forest Rec., 12 (1926), No. 9, pp. II+37, pls. 10*).—Despite severe handicaps such as protracted drought in the summer season and very rapid weed growth in the rainy season, forest species can be successfully regenerated provided proper attention is given to cultural details and the peculiar varietal characteristics of the seeds and seedlings.

Scotch pine pollen [trans. title], [J.] Busse (*Tharandter Forstl. Jahrb., 77 (1926), No. 8, pp. 225–231, pls. 2*).—Experiments at the Tharandt Forestry Experiment Station showed that Scotch pine pollen retains its viability over a long period if held in a dry condition. Beginning with 85 per cent, viability dropped to 37 per cent at the end of 3 weeks, and retained considerable activity at the end of 5 weeks. Pollen subjected to a temperature of 80° C. (176° F.) for 6 hours lost all viability. When moistened and redried, pollen retained its vitality.

A comparison of distilled water and sugar solutions as media for germinating pollen showed a more rapid and a greater germination in the sugars. Variation in the proportion of sugars had little effect on the results. After 48 hours in water practically all tubes had burst, a state reached more slowly in sugar solutions.

Scotch pine pollen is provided with winglike sacs which enable it to float for great distances through the air.

The effect of rolling Scotch pine seed beds [trans. title], E. G. Strehlke (*Forstarchiv, 2 (1926), No. 16, pp. 246–248, figs. 3*).—Experiments in the forest districts of Biesenthal, Germany, indicated that the rolling of shallow porous forest soil had a deleterious effect upon the germination and later development of Scotch pine seedlings.

Hand-book of conifers grown in the Arboretum, Bagley Wood, Oxford, J. B. Davy (*Oxford: Univ. Oxford, Dept. Forestry, 1926, pp. 44*).—This comprises brief notes upon the behavior and usefulness of various species.

The swamp cypresses, Glyptostrobus of China and Taxodium of America, with notes on allied genera, A. Henry and M. McIntyre (*Roy. Irish Acad. Proc., 37 (1926), Sect. B, No. 13, pp. 90–116, pls. 8*).—Accompanied by notes on the present distribution, uses, etc., detailed technical descriptions are presented upon macroscopic and microscopic characters of the tree and wood.

Manuring experiments in rubber, I, J. F. Schmöle (*Arch. Rubbercult. Nederland. Indië, 10 (1926), No. 6, pp. 233–301, pls. 3, figs. 4*).—Experiments conducted in a large number of rubber plantations located on the East Coast of Sumatra showed that nitrogen is the only effective element in increasing the yield of latex, and this only in plantations located on certain types of soil, notably the white and gray soils along the seacoast. The increased yields ranged from 5 to 30 per cent. On the red soils of volcanic origin, on the other hand, increased yields were obtained in only one of many cases. The planning of fertilizer experiments so as to reduce the experimental error to a minimum is discussed in some detail.

An English abstract (pp. 289–301) is included.

Wood fibres of some Australian timbers investigated in reference to their prospective value for paper-pulp production, R. T. BAKER and H. G. SMITH (*Sydney: Govt., 1924, pp. 159, figs. 65*).—Data are presented upon the length, width, and general characteristics of the fibers of 60 forest species of eastern Australia, together with notes upon felting and bleaching properties and the percentage amounts of derivable cellulose.

The Australian lumber market, J. R. FOSTER (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Trade Inform. Bul. 436 (1926), pp. II+38*).—Statistical data upon the size, nature, value, and distribution of lumber imports, of which the United States now supplies approximately 60 per cent. Suggestions are offered upon trade practices and the location of the more important markets.

DISEASES OF PLANTS

Report of the plant pathologist, O. F. BURGER (*Florida Sta. Rpt. 1925, pp. 42–46, 49–64*).—A slight outbreak of citrus canker at Boynton is reported. The disease appeared on four isolated lemon trees growing in a town lot. Melanose on orange trees was controlled by spraying with a Bordeaux-oil mixture, but poor results were secured in spraying grapefruit. Preliminary work was begun by L. E. DuPont on the coloring of citrus fruits, and the best results were obtained from the gas generated by kerosene stoves.

A summary is given of the work of R. E. Nolen on pecan scab, a more detailed account of which is noted on page 850.

A histological study was begun of scaly bark of citrus. This disease does not appear as severe as formerly, and it is said that it has not spread in many groves during the past five years.

Studies of coconut bud rot, the presence of which was previously reported (E. S. R., 54, p. 342), have been continued by J. L. Seal. Most of the work was confined to the isolation of the organism. It is claimed that the bud rot caused by *Phytophthora faberi* in Florida is confined to nurseries and young palms, while the disease occurring on bearing trees has, in almost every case, been due to Thielaviopsis. The bud rot infested area is said to extend from Miami to Fort Pierce.

Truck crop disease investigations conducted by Weber include reports on downy mildew of cucumber (E. S. R., 54, p. 746); control of *Corticium stevensii* on pear and *Physopella fici* on fig, by the use of 4–4–50 Bordeaux mixture; the occurrence of *Sclerospora graminicola* on millet; and the treatment of cucumber seed with corrosive sublimate and various commercial fungicides for the control of seed-borne diseases. Corrosive sublimate gave as good as or better control than any of the commercial preparations. No stimulation to germination was noted in any instance, but on the contrary a reduction in germination percentage of from 3 to 10 per cent was observed.

In continuation of the previous report (E. S. R., 54, p. 343) additional data are given on the investigations of citrus blight by Rhoads. This disease is believed to be a physiological trouble caused by extremes of soil moisture. Planting new groves on desirable types of soil and properly maintaining them is advised.

Potato investigations carried on by L. O. Gratz include seed potato improvement, seed potato diseases, blight control, and general observations on potato diseases. A comparison made of certified and uncertified seed potatoes of the same strains showed considerably less infection of plants from certified seed by some of the important diseases. Late blight caused considerable losses in several sections of the State.

Cotton disease investigations organized under the charge of A. F. Camp include studies on variety resistance to cotton wilt, seedling diseases, the delinting of cotton seed as a measure for the control of seed-borne diseases, angular leaf spot, anthracnose, etc. A number of varieties of cotton were found to exhibit marked resistance to wilt, and reciprocal crosses were made of some of these. The F_1 generation was grown to produce material for testing on wilt-infested soil. Delinting seed with sulfuric acid was found of advantage not only in the reduction of disease, but it made possible the planting of seed by a plate planter rather than by an ordinary planter. In dry soil this proved important, as the seed was covered by a layer of moist soil and germination hastened.

The occurrence of a physiological condition known as rust was observed, and in one instance the rust was followed by a heavy infection of Macrosporium and Alternaria, the infected plants being nearly defoliated.

Plant pathology (*Idaho Sta. Bul. 142 (1926), pp. 19, 20*).—The results of five years' experimental work are said to have shown that it is possible to keep a lot of seed potatoes practically free from virus diseases by isolation and roguing. Climatic conditions are recognized to have an important influence on these diseases, but the rapidity of dissemination of russet dwarf, mosaic, and leaf roll is said to depend very largely on the infected aphid population, proximity of infected potatoes, and the presence or absence of other host species of the virus.

The control of Rhizoctonia of potatoes is claimed by presprinkling and treating the seed tubers with formaldehyde.

Studies of bean diseases have shown that while the variety Robust was practically resistant to mosaic and outyielded the variety Little Navy, it was quite susceptible to dry-rot, caused by a species of Fusarium. The variety Red Mexican was said to be practically immune to dry-rot, while Great Northern and other varieties were resistant under normal conditions.

Strains of tomatoes resistant to western yellow tomato blight again proved their superiority over commercial varieties.

[Report of work done at the Michigan Station in plant pathology], R. Nelson (*Michigan Sta. Rpt. 1925, pp. 211–214*).—In the study of the biological characteristics of plant pathogens the former methods of the preparation of antigens were found unsatisfactory, but G. H. Coons and M. Carpenter are reported to have overcome some of the difficulties met with and to have found that the use of culture solutions containing aniline dyes offers a means for the recognition of species of fungi that are difficult of determination. More than 100 cultures of Fusarium have been tested by this method.

About 120 lbs. of seed of a yellows resistant strain of Golden Self-blanching celery were produced in California in cooperation with the U. S. Department of Agriculture for growing in land infested with the Fusarium which causes celery yellows.

In the investigation of bean diseases, cytological studies were made of mosaic-infected material in comparison with disease-free plants grown in the greenhouse. A selection made in 1924 is said to show apparent resistance to three of the principal bean diseases.

The results of investigations by Kotila and Coons on the blackleg disease of potato were noted (E. S. R., 53, p. 751). Experiments in spraying and dusting potatoes are said to have shown that Bordeaux mixture was superior to lime-copper dust. No stimulating effect due to Bordeaux mixture was noticed when diseases or insects were not present. Stocks of virus-free strains of Russet Rural, Green Mountain, Irish Cobbler, Bliss Triumph, and Early Ohio potatoes have been developed.

C. W. Bennett is said to have found five diseases of raspberries of the virus type, and the varietal range of each was determined. Transmission is said to have been accomplished by two species of aphids, *Amphorophora rubi* and *Aphis rubiphila*, and these insects are suspected of the spread of the diseases in the field. Temperature was found to be a factor on the expression of three of the diseases investigated. Roguing is said to have been efficient in some cases and of doubtful value in others for their control.

An investigation of yellows of asters and chrysanthemums was begun, and the identity of the disease on the two hosts and its spread by aphids were established.

Plant pathology (*New Hampshire Sta. Bul. 221 (1926), pp. 32, 33–35*).—Previous experiments by Butler (E. S. R., 36, p. 353) showed differing reactions of plants such as apple and peach to variations in the strength of Bordeaux mixture. Later work here reported is said to show that increasing the amount of lime to five times that of copper prevents nearly if not quite all injury.

Studies by L. J. Klotz on the comparative toxicity of arsenious oxide, hydrated lime in aqueous suspension, barium tetrasulfide, and ammoniacal silver chloride are said to have shown that ammoniacal silver chloride was the most active fungicide used. It was toxic at a strength of 0.00625 per cent to the spores of *Alternaria solani*, which are said to germinate readily in most of the fungicides in common use. Klotz also reports a study of the increase in area of flower parts of the apple between the dates usually given for spraying for scab control. Spraying experiments were continued for the control of scab on McIntosh and Baldwin apples, and Bordeaux mixture gave better control than lime sulfur when used alone. Injury to fruit was noticed where Bordeaux mixture was used, but russeting was slight where lime sulfur was employed. It is claimed that experiments on the variety Baldwin showed that lime-sulfur solution could satisfactorily replace Bordeaux mixture and that under light scab infection a prepink and calyx spray, or a pink and calyx spray, would give adequate control.

Experiments by Klotz failed to substantiate the claim frequently made that cultivating beans while wet with dew or rain tended to increase anthracnose. Field experiments on the control of anthracnose by spraying or dusting gave only slight protection. Heating seed for the time required to kill the anthracnose fungus was found to reduce seriously the germination of beans.

Means for combating plant diseases, M. Hollrung (*Die Mittel zur Bekämpfung der Pflanzenkrankheiten. Berlin: Paul Parey, 1923, 3. ed., rev., pp. XII+406, figs. 58*).—In this third edition (E. S. R., 31, p. 745) a systematic treatment is given of control measures for plant diseases and plant injuries due to higher plants and higher and lower animal organisms.

Partial sterilisation and control of soil pests and disease organisms (*Rothamsted Expt. Sta., Harpenden, Rpt. 1923–1924, pp. 33–35*).—A brief review of earlier as compared with more recent methods of partial sterilization of soil shows some improvement as to potency and cheapness. Direct field experiments on potato wart disease control (the only satisfactory method of procedure), while still tedious and costly, show that heat, formaldehyde, and sulfur are all effective in dealing with this disease, only the last being relatively cheap. The Simar cultivator is said to insure a desirable degree of thoroughness of admixture of the sulfur with the soil. Heavier soils apparently require larger proportions of sulfur. It is noted that potato scab (*Spongospora subterranea*) is apparently not here controllable by the sulfur treatment.

Biological and cultural studies of Exoascaceae.—I, Exoascus deformans, A. J. Mix (*Abs. in Phytopathology, 14 (1924), No. 1, p. 35*).—The maximum, minimum, and optimum temperature relations, H-ion concentration, etc., are reported for two species of Exoascus.

Spore germination of Phytophthora infestans, B. N. Uppal (*Abs. in Phytopathology, 14 (1924), No. 1, pp. 32, 33*).—The author reports the germination of spores of *P. infestans* where the oxygen about the cultures was extracted by an air pump and replaced by nitrogen. Potash-pyrogallol gave conflicting results. High boiling products of crude petroleum stimulated germination, while low boiling products, methyl alcohol, and formaldehyde inhibited it. The best germination occurred in 1 per cent of sugars.

Puccinia graminis on Poa spp. in the United States, E. C. Stakman and M. N. Levine (*Abs. in Pytopathology, 14 (1924), No. 1, p. 39*).—The presence of *P. graminis poae* on *Poa* spp. in Michigan is reported, and inoculation experiments with teliospores gave a heavy infection of barberry. Aecial inoculation resulted in the infection of three species of Poa, but of no other grasses or cereals.

Achyrodes aureum, a host for many rusts, S. M. Dietz and I. W. Clokey (*Abs. in Phytopathology, 14 (1924), No. 1, pp. 36, 37*).—The authors report that golden top grass, *A. aureum*, is infected by several species of Puccinia, among them *P. coronata*, *P. graminis*, *P. dispersa*, *P. montanensis*, and *P. poarum*, and their specialized forms.

Strains of the brown-rot fungus, Sclerotinia americana, W. N. Ezekiel (*Abs. in Phytopathology, 14 (1924), No. 1, p. 32*).—Studies of single spore strains of *S. americana* are said to indicate that the characters of the different strains are inherent and not the result of environment.

An abortive sporophore of Sclerotium rolfsii, J. J. Taubenhaus (*Abs. in Phytopathology, 14 (1924), No. 1, p. 37*).—In cultures of *S. rolfsii* the author found an abortive sporophore which, however, remained sterile.

Temperature relations of Urocystis cepulae, J. C. Walker and F. L. Wellman (*Abs. in Phytopathology, 14 (1924), No. 1, p. 26*).—The inhibitive effect of a soil temperature of 29° C. (84.2 ° F.) or above, previously reported (E. S. R., 46, p. 345), is considered due to the effect of the higher temperatures on the parasite.

Studies on predisposition of wheat and corn to seedling blight caused by Gibberella saubinetii, J. G. Dickson, S. H. Eckerson, and K. P. Link (*Abs. in Phytopathology, 14 (1924), No. 1, p. 34*).—Wheat is predisposed to seedling blight at high soil temperatures and corn at low. Soil moisture and light intensity are also limiting factors in predisposition to disease. The bearing of these factors on the chemical nature of germinating embryos is discussed.

New seed treatments for controlling stripe disease of barley, A. G. Johnson, R. W. Leukel, and J. G. Dickson (*Abs. in Phytopathology, 14 (1924), No. 1, p. 42*).—The authors claim that seed treatment with Semesan, Chlorophol, Germisan, and Corona Nos. 610 and 620 controlled the stripe disease and did not impair germination. Kalimat and formaldehyde reduced the amount of disease to a trace, but Pythal, Seed-O-San, and copper carbonate dusts failed to control it.

Wheat bunt investigations in Kansas, C. O. Johnston (*Abs. in Phytopathology, 14 (1924), No. 1, p. 37*).—Studies of resistance of wheat varieties to infection by *Tilletia laevis* and *T. tritici* are said to show considerable resistance to both species on the part of varieties of the Turkey type, while the soft winter wheats are more susceptible to *T. tritici*. Resistant varieties and hybrids from the Pacific coast retained this character when grown in Kansas.

Sowings at weekly intervals showed little infection until the mean daily soil temperature fell to about 40° F. From that temperature until 27° was reached smut infection increased. At both high and low temperatures the percentage of infection varied with the soil moisture.

Physiological studies on flag smut of wheat, M. A. Griffiths (*Abs. in Phytopathology, 14 (1924), No. 1, p. 39*).—Studies of *Urocystis tritici* have shown that the spores may remain viable for at least four years in the laboratory, and that overwintered spores are capable of infecting wheat. The optimum temperature for infection in the greenhouse was from 20 to 23° C. (68 to 73.4° F.), and infection took place most readily prior to the emergence of the seedling from the soil. A number of varieties, which are enumerated, remained smut free during the three years of the test.

Water and lime-water baths following the formaldehyde seed treatment, W. H. Tisdale and R. W. Leukel (*Abs. in Phytopathology, 14 (1924), No. 1, p. 43*).—Oats treated with formaldehyde and then rinsed or briefly soaked in water or limewater gave better germination and controlled smut satisfactorily. Either water or limewater prevented a great part of injury due to formaldehyde treatment of oats and wheat.

Further studies on new seed disinfectants, W. H. Tisdale, J. W. Taylor and R. W. Leukel (*Abs. in Phytopathology, 14 (1924), No. 1, pp. 43, 44*).—Tests are reported of a number of the new seed disinfectants regarding their effects on germination, vigor, and smut control of small grains.

Copper carbonate, Corona No. 40–S, and Seed-O-San controlled stinking smut satisfactorily without injury to the seed. From the standpoint of yield, copper carbonate and No. 40–S were slightly better than copper sulfate lime. None of the dusts were entirely satisfactory for the control of smuts of barley and oats. Of the liquid treatments, some of the organic mercury compounds gave good control of barley and oat smuts, and barley treated with Semesan or Chlorophol yielded better than untreated seed or seed treated by any other method. For the control of barley smuts, these compounds are said to have been more satisfactory than either hot water or formaldehyde.

Comparative efficiency of formaldehyde, copper-carbonate dust, and sulfur dust in controlling smuts in hulled oats, R. S. Kirby (*Abs. in Phytopathology, 14 (1924), No. 1, pp. 42, 43*).—Comparative trials of the dry formaldehyde treatment, copper carbonate dust at the rate of 4 and 2 oz. per bushel, and dusting sulfur at the rate of 1 lb. and 4 oz. per bushel indicate that the best control of smut in hulled oats was secured with 4 oz. per bushel of copper carbonate dust. The formaldehyde treatment was better than any other method except 4 oz. of copper carbonate dust, and 4 oz. of the latter gave better results than 2 oz. or any of the sulfur treatments.

Epidemiology studies with *Puccinia coronata*, S. M. Dietz (*Abs. in Phytopathology, 14 (1924), No. 1, p. 41*).—The relation of *Rhamnus cathartica* and *R. lanceolata* to attacks on oats by *P. coronata* is shown, and the sources of several infestations are traced.

Cytological evidence of physiologically distinct forms in Puccinia graminis tritici, R. F. Allen (*Abs. in Phytopathology, 14 (1924), No. 1, pp. 39, 40*).—Some cytological differences in strains or forms of *P. graminis tritici* are described, and the changes induced by the various forms in the tissues surrounding an area of infection are said to vary in size, appearance, extent of area affected, plasmolysis, and staining.

Progress in barberry eradication, F. E. Kempton (*Abs. in Phytopathology, 14 (1924), No. 1, pp. 40, 41*).—In continuation of the campaign for barberry eradication (E. S. R., 53, p. 748) the author states that to October 31, 1923, 656

counties in the cooperative area had been surveyed and 8,071,932 bushes destroyed. Crushed rock salt has proved the safest and best chemical means for destroying barberries.

An undescribed imperfect fungus associated with wheat foot-rot in Oklahoma, H. H. McKinney (*Abs. in Phytopathology, 14 (1924), No. 1, p. 34*).—The author reports having found a fungus associated with *Helminthosporium sativum* in causing foot-rot of wheat grown in Oklahoma. Later studies confirmed his conclusions, and the fungus has been described as *H. tetramera* (E. S. R., 54, p. 452).

The rate of spread of wheat foot-rot in tillage plats in Kansas, L. E. Melchers and M. C. Sewell (*Abs. in Phytopathology, 14 (1924), No. 1, pp. 41, 42*).—The rate of spread of *Ophiobolus cariceti* in tillage plats since the appearance of foot-rot in 1921 is shown. Early, deep plowing (6 to 7 in.) favored the spread of the disease, while late, shallow plowing (3 in.) inhibited it.

Varietal resistance of winter wheats to Tilletia levis, G. H. Coons (*Abs. in Phytopathology, 14 (1924), No. 1, pp. 38, 39*).—The results are given of two years' tests of the resistance to *T. levis* of about 40 varieties and strains of winter wheats. All the wheats, except Fultz, that showed the greatest resistance to *T. levis* were Turkey wheats or selections from crosses with this type.

Varietal susceptibility among beans to the bacterial blight, W. H. Burkholder (*Phytopathology, 14 (1924), No. 1, pp. 1–7*).—The results are given of a three-year study of the varietal susceptibility of beans to blight caused by *Phytomonas phaseoli*. A considerable number of varieties were tested by spraying the plants, when but little beyond the seedling stage, with a water suspension of bacteria, but no immune or highly resistant varieties were found, although certain degrees of susceptibility were noted.

Inoculations were also conducted with a number of species closely related to *Phaseolus vulgaris*, and all species proved more or less susceptible. The species tested were Henderson Bush Lima, white tepary, moth, adzuki, and mungo bean; California Blackeye cowpea; Ito San soy bean; and Georgia velvet bean.

The effect of late planting on the bacterial blight of beans, W. O. Gloyer (*Abs. in Phytopathology, 14 (1924), No. 1, p. 27*).—Late plantings (June 15 or later) have given less blight of Wells Red Kidney beans than earlier ones. Two periods of susceptibility are reported, before the appearance of the third leaf and beginning with the setting of the pods.

Notes on the Nematospora disease of Lima beans, H. W. Anderson (*Abs. in Phytopathology, 14 (1924), No. 1, p. 31*).—A disease of Lima beans found in southern Illinois is attributed to a species of Nematospora resembling *N. phaseoli*.

Bean wilt (Bacterium flaccumfaciens).—Further studies, F. Hedges (*Abs. in Phytopathology, 14 (1924), No. 1, p. 27*).—The author described in 1922 a wilt of navy bean (E. S. R., 47, p. 148). Since that time the parasite has been isolated from seed from Michigan, South Dakota, Montana, Maryland, District of Columbia, France, and Germany.

Control of black-rot and black-leg of cruciferous crops by seed and seed bed treatments, E. E. Clayton (*Abs. in Phytopathology, 14 (1924), No. 1, pp. 24, 25*).—For the control of *Bacterium campestre* on Brussels sprouts and *Phoma lingam* on cabbage, seed was treated with corrosive sublimate, hot water, and Bordeaux mixture. Complete control of black rot was secured with hot water

treatment of seed or by watering the soil three times with a solution of corrosive sublimate, and the same treatments greatly reduced blackleg infection. Bordeaux mixture applied to soil reduced blackleg but had little effect on black rot.

A progress report on black-rot investigations, with special reference to cauliflower on Long Island, E. E. CLAYTON (*Abs. in Phytopathology, 14 (1924), No. 1, p. 24*).—The author claims that *Bacterium campestre* winters over in stems of cabbage and Brussels sprouts, but that no cauliflower plants survive the winter. Attempts to produce the disease with cauliflower refuse gave negative results. Seed and seed bed treatments gave good control, and lime and fertilizers influenced the amount of disease.

Effect of the mercuric chloride treatment for maggot on Rhizoctonia and club-root of cabbage, W. O. GLOYER and H. GLASGOW (*Abs. in Phytopathology, 14 (1924), No. 1, p. 25*).—The application of a solution of corrosive sublimate to soils in which cabbage seedlings were growing, as recommended for maggot control, reduced or eliminated attacks of Rhizoctonia and clubroot.

Relation of soil temperature and soil moisture to infection by Plasmodiophora brassicae, J. MONTEITH, JR. (*Abs. in Phytopathology, 14 (1924), No. 1, p. 25*).—Soil temperature was found to have little effect on clubroot, except as it affected the host plant. Soil moisture had an influence on the disease, infection increasing from 50 per cent saturation and above.

Progress report on cabbage yellows investigations in Kansas, E. A. STOKDYK (*Abs. in Phytopathology, 14 (1924), No. 1, p. 24*).—As a result of three seasons' work it is claimed that the cabbage varieties Wisconsin All Seasons and Wisconsin Brunswick are resistant to yellows if the seed is sown in a hotbed and the seedlings transplanted to the field. No evidence of seed transmission of the disease was obtained. The Fusarium of aster wilt failed to cause yellows in cabbage.

Summary of investigations on clover rusts, W. H. DAVIS (*Abs. in Phytopathology 14 (1924), No. 1, p. 33*).—Observations and inoculation experiments with rust spores from common clovers showed that the white clover rust, *Uromyces trifolii-repentis*, *U. trifolii* from red and mammoth clovers, and *U. hybridi* from alsike clover are autoecious and separate species. Morphological differences are briefly indicated.

Bacterial stalk rot of corn, H. R. ROSEN (*Arkansas Sta. Bul. 209 (1926), pp. 28, pls. 3, figs. 5*).—In 1919 the author called attention to the occurrence of a bacterial disease of corn in Arkansas (E. S. R., 41, p. 747), and in a later contribution (E. S. R., 52, p. 448) the causal organism was described as *Pseudomonas dissolvens*. In the present publication detailed accounts are given of the disease and the organism which causes it.

The bacterial stalk rot of corn is said to occur in Arkansas, New York, North Carolina, Mississippi, Louisiana, Ohio, Illinois, North Dakota, and Arizona. In Arkansas it has been found to be serious during periods of the corn-growing season when the temperature, rainfall, and humidity are above normal. The organism primarily affects stalks and leaves, producing a light or dark brown rotting of bases of leaves, particularly those at the base of the stalks, and a rotting of the lower portion of the stalk. It was found that temperature played an important rôle in disease inception and development, no infections taking place at 20° C., and between 30 and 35° the greatest number of infections were obtained. Infections were found to take place through hydathodes, stomata, or injuries resulting from the extrusion of endogenous roots, and from insects.

Following the proposals of the Society of American Bacteriologists the name *Phytomonas dissolvens* n. n. has been adopted for the causal organism.

Studies on seed infection, ear types, and yield, and the isolation of strains of corn showing specific disease reactions in the germinator, W. D. VALLEAU (*Abs. in Phytopathology, 14 (1924), No. 1, pp. 46, 47*).—Germinator tests of well-cured ears of corn are said to show that plants die due to a rot starting at or near the seed. In general, rough ears produce the earliest dying plants. Selections of extremes of roughness and smoothness gave increased production for the smooth types. Studies on seed infection showed that seeds of the most apparently disease-free ears were heavily infected with fungi.

Studies on the Diplodia disease of corn, J. R. HOLBERT, B. KOEHLER, and G. H. DUNGAN (*Abs. in Phytopathology, 14 (1924), No. 1, p. 47*).—Five years' experiments with yellow dent corn grown from seed infected with *D. zeae* have resulted in reduced field stands and lowered vigor. Mature plants from infected seed showed less resistance to vertical pull than those from disease-free seed. Open-fertilized and inbred strains of corn differ in resistance to Diplodia disease. Treatment of infected seed with Chlorophol resulted in an increased yield of corn. Neither lime nor phosphates gave a significant increase in yield of corn from Diplodia-infected seed.

Some new methods and results in the control of lettuce diseases with formaldehyde, W. S. BEACH (*Abs. in Phytopathology, 14 (1924), No. 1, pp. 28, 29*).—The application of rather concentrated solutions of formaldehyde to soils, after which the soil was drenched with water, gave renumerative control of *Botrytis* sp. and *Sclerotinia libertiana* on lettuce.

A Fusarium bulb rot of onion, E. C. TIMS and J. C. WALKER (*Abs. in Phytopathology, 14 (1924), No. 1, pp. 26, 27*).—A Fusarium disease is reported in the onion bulb-growing section of Illinois, the causal organism of which is considered to agree with descriptions of *F. cepae*.

Susceptibility of species of Allium to onion smut, P. J. ANDERSON (*Abs. in Phytopathology, 14 (1924), No. 1, p. 26*).—Sixteen out of 18 species of Allium tested for susceptibility to onion smut proved infected.

Occurrence of white rot of Allium (Sclerotium cepivorum) in Europe and America, J. C. WALKER (*Abs. in Phytopathology, 14 (1924), No. 1, p. 26*).—The occurrence of the white rot of onions and leeks is reported in Oregon and Virginia.

Plant pathology [Rothamsted] (*Rothamsted Expt. Sta., Harpenden, Rpt. 1923–1924, pp. 36–38*).—Study of potato wart disease shows that an intimate admixture of sulfur at 12 cwt. per acre greatly reduces or eliminates the organism in case of light soils. A method is noted by the use of which it is possible now to distinguish between susceptible and immune potato varieties in a few weeks as opposed to a year or more by the former method of testing for resistance to potato wart. Investigations on mosaic disease were stimulated by finding that nodules containing certain organisms were obtained rather readily by inoculation with organisms from mosaic plants

Fungicidal treatments for the control of sorghum kernel smut, C. O. JOHNSTON and L. E. MELCHERS (*Abs. in Phytopathology, 14 (1924), No. 1, p. 44*).—The results are given of three years' tests in treating a number of varieties of sorghums with formaldehyde, Corona No. 620, Chlorophol, copper sulfate, Corona No. 40–S, Seed-O-San, and copper carbonate dusts for the control of smut caused by *Sphacelotheca sorghi*. The formaldehyde treatment controlled smut but lowered the germination. Satisfactory control was obtained by soaking seed in copper sulfate or Chlorophol solutions, or by dusting with copper carbonate or Corona No. 40–S, but there was some injury to the seed.

A new downy mildew on soy beans, S. G. LEHMAN and F. A. WOLF (*Abs. in Phytopathology, 14 (1924), No. 1, p. 28*).—A downy mildew of soy beans caused by *Peronospora sojae* n. sp. is reported.

Soy bean pustule: Comparative studies with Bacterium phaseoli sojense and Bacterium phaseoli, F. HEDGES (*Abs. in Phytopathology, 14 (1924), No. 1, pp. 27, 28*).—Cross inoculations with *B. phaseoli sojense* and *B. phaseoli* are said to have shown that the former will infect Phaseolus but is more infectious to soy bean, while the latter is only weakly parasitic to soy bean. Evidence was secured indicating that the virulence of *B. phaseoli sojense* was increased for Phaseolus by passing it through that host.

Studies on Fusarium wilt of spinach in Texas, J. J. TAUBENHAUS (*Abs. in Phytopathology, 14 (1924), No. 1, p. 29*).—A Fusarium disease of spinach is reported in Texas that is said to differ from that described from Idaho, which is attributed to *F. spinaceae*.

Tobacco disease investigations, W. B. TISDALE (*Florida Sta. Rpt. 1925, pp. 82–87*).—Black shank, a disease due to *Phytophthora* sp., has already been described (E. S. R., 55, p. 654). Additional investigations on host plants of the fungus are said to have shown that the castor oil plant is very susceptible to the disease. Cooperative experiments are reported upon in which comparisons were made of the resistance of strains of tobacco to black shank, 105 selections and hybrids having been tested. A high degree of resistance was found in some strains of Big Cuba, and crosses have been made between these and other varieties to secure resistance to disease. Tests of the F_2 generation have shown partial resistance where Big Cuba has been used as one of the parent plants.

Experiments on the wintering over of wildfire caused by *Bacterium tabacum* are said to indicate that the organism is not carried over in the soil.

Strains of tobacco reported as highly resistant to root rot (*Thielavia basicola*) in 1924 (E. S. R., 54, p. 348) were again tested, but there was little disease owing to weather conditions. However, the resistant strains made uniform growth and matured two weeks earlier than the commercial type.

An injury of tobacco plants due to the use of a corn meal-lead arsenate mixture applied for the control of bud worms is reported, a more detailed account of the injury having been noted previously (E. S. R., 55, p. 753).

A general survey of the tobacco situation in Florida is said to have shown a reduction in the area planted to shade-grown tobacco, due to the occurrence of black shank and unfavorable markets and a great increase in the area planted to bright tobacco during the year. Wildfire, black fire, and mosaic caused little loss during the year, but root knot was quite prevalent. The occurrence of mosaic in a cooperative plat is attributed to insect carriers of the disease.

Tomato wilt, R. P. WHITE (*Abs. in Phytopathology, 14 (1924), No. 1, p. 28*).—Selections of resistant individuals made in the F_2 generation from a cross between susceptible and resistant parents have proved resistant in the F_3 and F_4 generations. High soil temperatures are said to favor the disease, and soil moistures below 17 or above 27 per cent of dry weight prevent infection.

A sclerotium disease of yautia, M. T. COOK and R. A. TORO (*Abs. in Phytopathology, 14 (1924), No. 1, p. 29*).—A disease of yautia due to *S. rolfsii* is described as occurring in Porto Rico.

Progress report on crown gall experiments conducted at the University of Tennessee Experiment Station, J. A. MCCLINTOCK (*Tenn. State Hort. Soc. [etc.] Proc., 19 (1924), pp. 86–88*).—Results obtained at Knoxville and elsewhere in Tennessee indicate that mercuric chloride disinfection of nursery stocks and scions to reduce crown gall is well worth employment on a commercial scale. Crown gall structures are found to be present some distance above the location of the external gall. Use of scion wood from trees showing crown gall is discouraged.

Relations of temperature and moisture to the development of crown gall, A. J. RIKER (*Abs. in Phytopathology, 14 (1924), No. 1, p. 30*).—Tomato plants grown under soil temperature and soil moisture control are said to show that the size of crown gall increased with the temperature up to about 22° C. (71.6° F.) and then decreased. Galls developed in all percentages of soil moisture up to 80 per cent, the larger sizes occurring with increased moisture up to 60 per cent of the water-holding capacity of the soil.

Winter injury (*New Hampshire Sta. Bul. 221 (1926), p. 23*).—In an investigation of winter injury to apple trees, G. F. Potter made a detailed study of the histology of winter injury, as well as of chemical investigations of the composition of hardy and nonhardy roots. Preliminary experiments are said to have shown that roots which have been withered show only half as much injury from freezing as do moist or turgid ones. The relation of chemical composition to this change is being investigated.

Sepal infection in relation to the seasonal development and control of apple scab, G. W. KEITT and L. K. JONES (*Abs. in Phytopathology, 14 (1924), No. 1, p. 36*).—Sepal infection by apple scab before the usual pink spray period is said to be an important source of secondary infection in Wisconsin. A well-timed prepink spray controlled the disease.

***Seasonal development and control of apple scab and cherry leaf spot in* relation to environment,** G. W. KEITT and L. K. JONES (*Abs. in Phytopathology, 14 (1924), No. 1, p. 36*).—Comparative studies of apple scab and cherry leaf spot in Wisconsin have shown that apple scab is a low temperature disease, and that the critical period of development is in the spring, while cherry leaf spot is a high temperature disease that develops during summer. Based on this information, the authors recommend two preblossom sprays for the control of apple scab, while for cherry leaf spot the preblossom application previously suggested may be omitted.

Strawberry leaf-scorch, F. A. WOLF (*Abs. in Phytopathology, 14 (1924), No. 1, p. 30*).—A brief account is given of a leaf scorch of strawberry, the cause of which has been determined to be *Diplocarpon earliana* (E. S. R., 53, p. 754).

Dieback of citrus, R. W. RUPRECHT (*Florida Sta. Rpt. 1925, pp. 28–30*).—In continuation of investigations on die-back of citrus (E. S. R., 54, p. 351) the author reports good growth of the trees in the experimental grove, and no disease.

The trees grown in tanks at the station maintained normal growth, with no indication of die-back. Drainage waters were again collected from the various tanks and subjected to analysis. The total amount of drainage water for the year was about the same as previously reported, and the general differences previously noted in the composition of the waters from the different tanks were again found.

Attention is called to the increased loss of iron where ammonium sulfate was applied, and as many Florida soils are low in this element it is believed that the continued use of ammonium sulfate might result in an iron deficiency.

[Pecan] disease control, G. H. BLACKMON (*Florida Sta. Rpt. 1925, pp. 76, 77*).—In cooperation with the department of plant pathology a study of pecan scab has been continued. Preliminary experiments are said to have shown that the disease can be controlled on the variety Schley, which is very susceptible to scab, by applications of 4–4–50 Bordeaux mixture at intervals of 2, 3, and 4 weeks, preceded by a dormant spray in February. The experiment in pecan scab control has been extended to spraying and dusting experiments on three orchards to secure more definite information as to times of application.

A sclerotial disease of cultivated Delphinium, D. S. WELCH (*Abs. in Phytopathology, 14 (1924), No. 1, p. 31*).—Diseased Delphinium plants from New York,

Pennsylvania, Indiana, and New Jersey were found attacked by a fungus, for which the author proposes the name *Sclerotium delphinii*.

The gray bulb-rot of tulips, H. H. WHETZEL and J. M. ARTHUR (*Abs. in Phytopathology, 14 (1924), No. 1, pp. 30, 31*).—The presence is reported in America of a bulb rot of tulips due to *Sclerotium tuliparum*.

Decay of wood and groundwood pulp, M. W. BRAY (*[Tech. Assoc. Pulp and Paper Indus.], Tech. Assoc. Papers, 7. ser., No. 1 (1924), pp. 91–93, figs. 3*).—With data obtained from the chemical analysis of samples of ground-wood pulps inoculated with certain wood-destroying fungi, as *Fomes pinicola*, *F. roseus*, *Trametes pini*, *Lentinus lepideus*, *Paxillus panuoides*, and *Corticium galactinum*, interrelationships have been established involving solubility in hot water, solubility in 1 per cent caustic soda solution, cellulose content, and lignin content; and relationships have been demonstrated between these values and the losses, volatile and total, suffered during decay.

It is stated that from a knowledge of the solubility in 1 per cent sodium hydroxide solution of a sample of ground wood infected with the types of fungi herein studied, the above values and losses may be calculated with a fair degree of accuracy.

Nematode control, J. R. WATSON (*Florida Sta. Rpt. 1925, pp. 37, 38*).—In continuation of previous experiments for nematode control in seed beds (E. S. R., 54, p. 345), studies are said to have shown that a single application of calcium cyanide can be substituted for the double treatment of sodium cyanide and ammonium sulfate. However, about double the quantity of calcium cyanide is required, and the labor cost between one and two applications would be about the only saving. No water is necessary when calcium cyanide is used.

Results of preliminary tests of calcium cyanide for controlling nematodes on peach trees are said to have been very encouraging. Trees on plats which received calcium cyanide at the rate of from 500 to 750 lbs. per acre are said to have been more thrifty and more productive than those receiving either more or less of the cyanide.

Mulching peach and fig trees with tarred paper did not prove satisfactory for nematode control.

ECONOMIC ZOOLOGY—ENTOMOLOGY

The origin of birds, G. HEILMANN (*London: H. F. & G. Witherby, 1926, pp. [7]+208, pl. 1, figs. 142*).—Part 1 of this work (pp. 1–64) deals with some fossil birds, part 2 (pp. 65–98) with the embryonic stages of reptiles and birds, part 3 (pp. 99–134) with some anatomical and biological data, and part 4 (pp. 135–202) with the Proavian.

Our bird friends and foes, W. A. DUPUY (*Philadelphia: John C. Winston Co., 1925, pp. XX+319, pl. 1, figs. 48*).—This is a practical account.

Bird life on island and shore, H. GUTHRIE-SMITH (*Edinburgh: William Blackwood & Sons, 1925, pp. XIX+195, pls. 67*).—This is a popular account of bird life in New Zealand.

The birds of the Riviera, C. INGRAM (*London: H. F. & G. Witherby, 1926, pp. XV+155, pls. 6, figs. 11*).—This is an account of the avifauna of the Côte d'Azur from the Esterel Mountains to the Italian Frontier, based upon investigations extending over a long period.

Problems of bird-migration, A. L. THOMSON (*London: H. F. & G. Witherby, 1926, pp. XV+350, figs. 12*).—In this book, which aims at a statement of the problems presented by the phenomenon of bird migration, part 1 consists of an outline of bird migration, in which the principal known facts are summarized (pp. 27-123); part 2 deals with some special studies, with particular

reference to the results of bird marking (pp. 125-255); and part 3 deals with the main problems, such as the ends served, the originating cause, the nature of the annually recurring stimuli to migration, factors determining the path and goal of migration flight, and the wider biological implications of migration (pp. 257-327). A note on some practical bearings of the study of bird migration is presented as an appendix (pp. 329-337). Several lists of references are included.

The poison production in animals from the zoophysiological standpoint, J. STROHL (*Die Giftproduktion bei den Tieren von Zoologisch-physiologischem Standpunkt. Leipzig: Georg Thieme, 1926, pp. 56*).—A general discussion of the subject presented in connection with a bibliography of nine pages.

Tularemia in wild rats, L. V. DIETER and B. RHODES (*Jour. Infect. Diseases, 38 (1926), No. 6, pp. 541–546*).—During the course of the routine examination of rats for plague infections following the outbreak of pneumonic plague at Los Angeles in the fall of 1924, the existence of latent *Bacterium tularense* infections in wild rats was established by inoculation experiments, by cultures on egg yolk medium, and by agglutination tests. The lesions in the naturally infected rats are not characteristic, and the nature of the infection can only be established by inoculations of guinea pigs.

The biology of host-parasite relationships among protozoa living in man, R. W. HEGNER (*Quart. Rev. Biol., 1 (1926), No. 3, pp. 393–418, pls. 3, fig. 1*).—This account includes a list of 64 references to the literature.

The insect menace, F. P. MACKIE (*Indian Sci. Cong. Proc. [Calcutta], 12 (1925), pp. 227–244*).—In this address the president of the medical research section discusses the importance of the problem, the antiquity of insects, the development of their parasitic habit, and the transmission of disease by insects, and reviews the arthropod carriers of disease and the application of our knowledge to the problems of public health.

The protection of buildings against vermin, E. G. BLAKE (*London: Crosby Lockwood & Son, 1926, pp. X+85, figs. 4*).—A practical account.

Insect enemies of the flower garden, C. A. WEIGEL and W. MIDDLETON (*U. S. Dept. Agr., Farmers' Bul. 1495 (1926), pp. II+54, figs. 90*).—This is a practical summary of information with means of control for insect pests of annual, perennial, and hardy flowering and ornamental plants.

Studies on contact insecticides, I–III, F. TATTERSFIELD, C. T. GIMINGHAM, and H. M. MORRIS (*Ann. Appl. Biol., 12 (1925), Nos. 1, pp. 61–76, figs. 3; 2, pp. 218–262, figs. 12*).—The first part of this paper (pp. 61–65) from the Rothamsted Experimental Station forms a general introduction to investigations carried out on contact insecticides. The methods used are briefly described, and some consideration is given to the mode of expressing results.

The second part (pp. 66–76) deals in detail with the insecticidal properties of *Tephrosia vogelii*, which with other species of this genus occurs abundantly in many parts of the world. The aqueous and alcoholic extracts of the leaves and seeds of *T. vogelii* are shown to be highly toxic to *Aphis rumicis* L., the toxicity being of the same order as that of nicotine. Extracts of the stems have not proved so poisonous. The plants of the genus Tephrosia seem to offer possibilities for practical use as insecticides.

In the studies reported in Part III (pp. 218–262), the authors determined that the order of toxicity to *Aphis rumicis* adults of the hydrocarbons and their chloro- and nitro-derivatives is benzene$<$toluene$<$xylene$<$monochlorobenzene $<$*p*-dichlorobenzene$<$*o*-dichlorobenzene$<$trichlorobenzene$<$nitrobenzene$<$*m*-dinitrobenzene. The monochloronitrobenzenes have about the same toxicity as nitrobenzene; 1-chloro-2:4-dinitrobenzene is slightly less toxic than *m*-dinitrobenzene.

"Phenol and the three isomeric cresols are toxic to aphids only at high concentrations. The mononitrophenols and cresols are all more toxic than the parent substances, the order of toxicity of the phenols being *o*-nitrophenol< *m*-nitrophenol, and *p*-nitrophenol<2:4-dinitrophenol>trinitrophenol; and the same order applies to the cresols and their corresponding derivatives. α-chloronaphthalene proved to be the most toxic of the naphthalene derivatives tested.

"With few exceptions, the relative toxicities of the various compounds to the insect eggs are approximately in the same order as to the aphids. The nitro derivatives of phenol and the cresols were specially studied, and it was shown that, as in the case of aphids, the dinitro compounds are more toxic to eggs than either the mono- or the trinitro compounds. 3:5 dinitro-*o*-cresol is shown to have a toxicity both to adults of *Aphis rumicis* and to eggs of *Selenia tetralunaria*, which is of the same order as that of nicotine. Some of the componnds tested may prove to be of value as winter spray fluids for trees in a dormant condition, although injurious to foliage, and experiments on a practical scale are in hand.

"A consideration of the results as a whole leads to the conclusion that no simple generalization as to the correlation of toxicity with any one chemical or physical property is possible in the present stage of our knowledge. It is probable that the nature of the toxic activity depends on chemical constitution, whereas intensity of activity is determined by one or more physical properties."

Report of entomologist, J. R. WATSON (*Florida Sta. Rpt. 1925, pp. 36, 37, 38, 39*).—Accounts are given of the citrus aphid, its natural enemies, and control; preliminary tests of calcium cyanide for peach borers; and of the celery leaf tyer. In the Report of the Assistant Entomologist, A. H. Beyer, which follows (pp. 39–41), work with pecan insects and the bean jassid is discussed.

[Report on entomology at the Idaho Station] (*Idaho Sta. Bul. 142 (1926), pp. 16, 17*).—This is a brief statement of the entomological work of the year.

Unusually low temperatures in December, 1924, resulted in extremely high mortality for many insects, that of the alfalfa weevil having been 95 per cent, of the fruit tree leaf roller eggs 87.2 per cent, and of the snowy tree cricket eggs 99.1 per cent. It is said that practically all codling moth larvae wintering about the snow line were killed, and a microscopical examination of 40,000 San Jose scale taken from widely separated orchards of southern Idaho showed that only 0.51 per cent of those wintering above the snow line survived, while of those below the snow line 42.89 per cent survived. Parasitism of alfalfa weevil by *Bathyplectis curculionis* reached as high as 50 per cent in certain fields. Calcium fluosilicate was found to be of no value in the control of the alfalfa weevil. Control work with eggs of the fruit tree leaf roller showed the more highly refined oils to be decidedly the more effective. A spray composed of 0.5 per cent of engine oil and nicotine sulfate (40 per cent) at the rate of $\frac{1}{16}$ pint per 100 gal. of water proved to be nearly 100 per cent effective against the thistle aphid on plum trees.

Report of the section of entomology, R. H. PETTIT (*Michigan Sta. Rpt. 1925, pp. 217–225, figs. 12*).—This is a brief report on the occurrence of and work of the year with insect pests. The hymenopteran *Ascogaster carpocapsae* Vier. was reared from codling moth sufficiently often to warrant the expectation that it may make itself felt as a factor in controlling this pest. The elm leaf beetle appeared in the State during the summer of 1924 for the first time and seriously damaged elms in the city of Monroe. *Leucothrips nigripennis* appeared in greenhouses and caused injury to ferns.

Economic entomology (*New Hampsire Sta. Bul. 221 (1926), pp. 11–13*).—The results of life history studies of the European corn borer are briefly reported. The records of three consecutive years show that about 60 per cent

of the borers exhibit two generations under New Hampshire conditions. Observations of the stalk borer, which has been found in 22 different host plants under field conditions in the State, are recorded. At least one species of black fly new to science has been found to occur in the State.

[Economic insects in Brazil], C. MOREIRA (*Min. Agr., Indus. e Com., Inst. Biol. Defesa Agr. [Brazil] Bols. 2 (1925), pp. 34, figs. 19; 3, pp. 23, pls. 3; 4, pp. 15, pls. 5*).—These bulletins deal with Aphids of Brazil, The Coffee Berry Borer (*Stephanoderes coffeae* Hag.), and The Sugar Cane Froghopper, *Tomaspis liturata* L. & S. In the account on aphids 18 species are considered.

[Economic insects in Sweden] (*Meddel. Centralanst. Försöksv. Jordbruksomrädet [Sweden], 1925, Nos. 280, pp. 70, figs. 41; 283, pp. 25, figs. 21; 287, pp. 87, pl. 1, figs. 42; 288, pp. 56, figs. 12*).—These contributions consist of (1) Aphidological Studies, II, by A. Tullgren, part 1 of which has been noted (E. S. R., 23, p. 54); (2) The Celery Fly, *Philophylla* (*Acidia*) *heraclei* L., as a Pest in Sweden, by O. Lundblad and A. Lindblom; (3) *Cicadula sexnotata* Fall. and Some Other Jassids of Economic Importance, by A. Tullgren, which includes supplements, (a) An Investigation on the Distribution and Importance of Jassid Injury in 1918 in Södermanland and East Gothland, with an Approximate Calculation of the Resultant Losses, by A. Lindblom (pp. 73–78), and (b) Strepsiptera and Hymenoptera Parasitic on Homoptera, by O. Ahlberg (pp. 79–86); and (4) the Beet Fly (*Pegomyia hyoscyami* Pz.) and the Great Beet Fly Outbreak of 1924, by N. A. Kemner.

[Contributions on economic insects] (*Ztschr. Angew. Ent., 11 (1925), Nos. 1, pp. 1–185, figs. 17; 2, pp. 187–324, figs. 36*).—The papers presented in No. 1 relating to insects of economic importance (E. S. R., 53, p. 652) include the following: Weevil Studies.—I, The Generation of *Hylobius abietis* L., by M. Dingler (pp. 1–22); The Parasites of the Pine Moth [*Panolis piniperda*], 68 in number, by W. Baer (pp. 23–34); Contribution to the Knowledge of the Fauna of Forest Litter: Spruce Litter Investigations, by J. von Pfetten (pp. 35–54); The Biology of *Cryptocephalus pini* L., by H. Prell (pp. 55–62); Tea Pests in the Dutch East Indies and Their Control.—II, An Injurious Outbreak of *Phytorus dilatatus* Jac. (Chrysomelidae), by R. Menzel (pp. 63–76) (E. S. R., 52, p. 554); Is *Silvanus surinamensis* L. a Grain Pest? by J. Jablonowski (pp. 77–112); Injury to Oats by Thysanoptera, by R. Kleine (pp. 113–131); *Perilitus melanopus* Ruthe (Braconidae), a Parasite of the Adults of *Ceutorrhynchus quadridens* Panz., and a Brief Résumé of the Knowledge of Hymenopterous Parasites of Adult Beetles, by W. Speyer (pp. 132–146); The Behavior of Birds to the Nun Moth in Bohemia and Moravia during the Period 1888–1924, by J. Růžička (pp. 147, 148); Parasites of Elaterid Larvae, by H. Blunck (pp. 148, 149); The Protozoan Parasites of the Stable Fly, by G. Jegen (pp. 149–151); Bark Beetles and Mites, by K. E. (pp. 151, 152), etc.

The papers presented in No. 2 include the following: *Pityophthorus henscheli* Seitner and Its Parasite *Cosmophorus henscheli* Ruschka, by M. Seitner and P. Nötzl (pp. 187–196); Contribution to the Knowledge of Forest Braconidae, by F. Ruschka (pp. 197–202); The Biology and Morphology of *Pimpla examinator* Fab., by N. F. Meyer (pp. 203–212); A Contribution on the Pine Geometrid Question, by Jucht (pp. 213–245); The Behavior of Palearctic Birds toward the More Important Forest Insects: Biozonalogical Studies, IV, by A. von Vietinghoff von Reisch (pp. 247–254); Animal Pests of the Coconut Palm, by V. Lommel (pp. 255–272); The Coccid Fauna of Baden, by H. Wünn (pp. 273–296); and miscellaneous contributions.

The green tomato bug (Nezara viridula L.), L. J. NEWMAN (*Jour. Dept. Agr. West. Aust., 2. ser., 3 (1926), No. 1, pp. 68–75, figs. 7*).—This is an account of *N. viridula*, which was first brought to the author's notice in 1920, when it

was found attacking tomatoes, beans, potatoes, and other garden plants around the port of Bunbury, Western Australia. Though not yet a serious pest, it has become widespread in the State.

The citrus aphid in Cuba, J. B. Anderson (*Fla. Ent.*, *9* (*1926*), *No. 4*, *p. 57*).—A brief reference is made to the fact that this aphid has been found to occur on oranges in groves in Santa Clara and Camagüey Provinces, Cuba.

The life history and bionomics of Aphis rumicis, J. L. Horsfall (*Iowa Univ. Studies Nat. Hist.*, *11* (*1925*), *No. 2*, *pp. 57*, *pls. 9*).—This is a report of studies by the author, in connection with a review of the literature, of *A. rumicis*, which, in America, seriously infests *Viburnum opulus* in the spring, *Euonymus*, nasturtiums, seed stalks of beets and spinach, horse beans, and a large number of weeds. In Europe, the species has been known as a serious pest of varieties of beans, *Vicia faba*, Shirley poppies, mangels, and Euonymus. A list of 99 references to the literature is included.

Aphis diseases, O. F. Burger (*Florida Sta. Rpt. 1925*, *pp. 46–49*).—In a study of aphid diseases, W. A. Kuntz found that four distinct groups of organisms may be the cause of the death of the aphids on citrus, including two species of entomogenous fungi of the genus Empusa, several species of Cladosporium, bacterial parasites, and a fungus collected from Fort Myers. The number of such organisms associated with dead *Aphis pomi* on citrus is tabulated for 18 localities. The rapidity of death under natural conditions is discussed.

The coccidae of Cuba and their host plants [trans. title], C. H. Ballou (*Cuba Estac. Expt. Agron. Bol. 51* (*1926*), *pp. 47*).—This list of the Coccidae of Cuba includes their host plants and the localities and dates of collection.

The red-backed cutworm and its control in the Prairie Provinces, K. M. King (*Canada Dept. Agr. Pamphlet 69*, *n. ser.* (*1926*), *pp. 13*, *figs. 5*).—This account relates to *Euxoa ochrogaster* Gn., which feeds upon a wide range of food plants and is the most widely distributed and most generally destructive cutworm in Canada.

The life history and control of the pecan nut case bearer (Acrobasis caryae Grote), S. W. Bilsing (*Texas Sta. Bul. 328* (*1926*), *pp. 3–77*, *figs. 25*).—This is a report of investigations which deal particularly with the life history of *A. caryae* during the years 1918–1923 and control work from 1919 to 1922. Earlier accounts of this work have been noted (E. S. R., 45, p. 258; 53, p. 361), since which the name has been changed from *A. caryivorella* to *A. caryae*. Diagrams showing its life history at College Station during the years 1918 to 1923 are included.

It was found that spraying to control the pest is not practicable when the infestation is less than from 8 to 10 per cent. The use of arsenate of lead at the rate of 3 lbs. per 50 gal. of water has been found most effective. It should be applied only with a good power spraying machine which will maintain a pressure of from 250 to 300 lbs., and a standard spray gun. The trees should be thoroughly drenched, as the degree of control is determined in a great measure by the amount of spray remaining on the buds as well as on the nuts. It has not so far been found practicable to spray for any but the first-generation larvae. Under the most favorable climatic conditions 85 per cent of control has been secured, but under unfavorable conditions an equal percentage of the nuts have been lost.

[**Control of horse flies (Tabanidae)**], G. E. Tedder (*Florida Sta. Rpt. 1925*, *p. 98*).—Of several repellents tested the one which gave satisfactory results consisted of powdered resin 2 lbs., laundry soap 2 lbs., fish oil 2 pints, oil of tar 2 pints, and kerosene 3 pints.

Bot flies of the Punjab, H. E. Cross (*Agr. Research Inst., Pusa, Bul. 160* (*1925*), *pp. 16, pls. 8, fig. 1*).—This account deals with warbles in cattle, goats, sheep, and horses, and bots in camels, sheep, goats, oorial or wild sheep (*Ovis cycloceros*), and horses.

[Sand fly studies in India] (*Indian Med. Research Mem. 4* (*1926*), *pp. 113–218, pls. 19, figs. 6*).—Papers relating to the sand fly presented in the first report of the Kala-azar Commission, India, include the following: On a Herpetomonas Found in the Gut of the Sandfly *Phlebotomus argentipes*, Fed on Kala-azar Patients.—A Preliminary Note, by R. Knowles, L. E. Napier, and R. O. A. Smith (pp. 113–121); The Development of the Parasite of Indian Kala-azar in the Sandfly *Phlebotomus argentipes* Annandale and Brunetti (pp. 123–125), Further Observations on the Feeding of Sandflies, *Phlebotomus argentipes*, on Cases of Indian Kala-azar (pp. 127–133), Development of the Parasite of Indian Kala-azar in the Sandfly *Phlebotomus argentipes:* Controls (pp. 135–139), and Development of the Parasite of Indian Kala-azar in the Sandfly *Phlebotomus argentipes*: Re-fed Flies and Further Results of the Feeding of Sandflies on Kala-azar Cases (pp. 141–145), all by S. R. Christophers, H. E. Shortt, and P. J. Barraud; Further Observations on the Feeding of Sandflies, *Phlebotomus argentipes*, on Cases of Kala-azar in Calcutta, by L. E. Napier and R. O. A. Smith (pp. 147–153); The Feeding of Larvae of *Phlebotomus argentipes* Annandale and Brunetti on Cultures of *Leishmania donovani*, by S. R. Christophers, H. E. Shortt, and P. J. Barraud (pp. 155, 156); Note on a Massive Infection of the Pharynx of *Phlebotomus argentipes* with *Herpetomonas donovani*, by H. E. Shortt, P. J. Barraud, and A. C. Craighead (pp. 157–160); A Study of the Bionomics of *Phlebotomus argentipes*, with Special Reference to the Conditions in Calcutta, by L. E. Napier and R. O. A. Smith (pp. 161–172); Technique Employed in Breeding *Phlebotomus argentipes* in Assam (pp. 173–175) and The Anatomy of the Sandfly *Phlebotomus argentipes* Ann. and Brun. (Diptera).—I, The Head and Mouth Parts of the Imago (pp. 177–204), both by S. R. Christophers, H. E. Shortt, and P. J. Barraud; Note on *Bodo phlebotomi* (*Herpetomonas phlebotomi*) (Mackie, 1914): A Re-consideration of Its Generic Position, by H. E. Shortt (pp. 205, 206); and Report upon a Sandfly Survey of Madras Town, by P. J. Barraud (pp. 207–218).

[Sandfly studies in India] (*Indian Jour. Med. Research, 13* (*1926*), *No. 4, pp. 923–1026, pls. 12, figs. 11*).—Further papers relating to sand flies (see above) include An Account of Methods in Feeding and Refeeding Sandflies, *Phlebotomus argentipes*, for the Second and Third Time, on Man and Animals, by H. E. Shortt, P. J. Barraud, and A. C. Craighead (pp. 923–942); Further Observations on the Breeding of *Phlebotomus argentipes* in Assam, by H. E. Shortt, P. J. Barraud, and C. S. Swaminath (pp. 943–946); The Life-History and Morphology of *Herpetomonas donovani* in the Sandfly *Phlebotomus argentipes*, by H. E. Shortt, P. J. Barraud, and A. C. Craighead (pp. 947–960); Sandflies and Sandfly Fever in the Peshawar District, by T. C. McC. Young, A. E. Richmond, and G. R. Brendish (pp. 961–1022); and Report on the Acari Found on or Associated with Sandflies in India, by S. Hirst (pp. 1023–1026).

Methods of combating the olive fly, A. F. de Seabra (*Instruções sôbre os Processos Aconselhados para Combater o "Dacus oleae" ou Mosca da Azeitona. Coimbra: Laboratório de Patologia Vegetal, Almeida, 1924, pp. 25, fig. 1; abs. in Internatl. Rev. Sci. and Pract. Agr.* [*Rome*], *n. ser., 3* (*1925*), *No. 1, p. 276*).—This is a practical summary of control measures for the olive fly, an account of which, by the author, has been noted (E. S. R., 54, p. 460).

International conference at Madrid on olive fly control, A. F. de Seabra (*Conferência Internacional de Madrid sôbre os Meios de Luta Contra o "Dacus oleae" ou Mosca da Azeitona. Coimbra, 1924, pp. 59, pl. 1, fig. 1*).—This is a

report of work at the 1924 conference (E. S. R., 52, p. 856), with control measures for this pest, an account of which by the author is noted above. A bibliography of three pages is included.

A note on a dipterous parasite of ladybirds, O. W. Richards (*Ent. Mo. Mag., 3. ser., 12 (1926), No. 136, p. 99*).—The author records observations of the parasitism of the pupa of the ladybird beetle *Adalia bipunctata* L. and what was probably *Mysia oblongoguttata* L. by the phorid fly *Phalacrotophora fasciata* Fall., at Oxshott, Surrey, during the summer of 1925.

The distribution of Muscina pascuorum Meigen in America, C. W. Johnson (*Psyche, 33 (1926), No. 1, pp. 20, 21*).—Further records are given of the distribution of this dipteran in North America (E. S. R., 52, p. 157), which the author records as entering houses in eastern Massachusetts in considerable numbers in the fall of 1925.

The red pumpkin beetle, Aulacophora abdominalis Fb. (Coleoptera, Chrysomelidae), *and its control; with a short note on A. atripennis Fb.*, M. Afzal Husain and S. Abdullah Shah (*India Dept. Agr. Mem., Ent. Ser., 9 (1926), No. 4, pp. 29–57, pls. 3*).—This is a report of investigations of a pest of cucurbits which has been reported from both shores of the Mediterranean, Sudan, Ceylon, Mesopotamia, and Australia, and which occurs all over India.

On some Indian Cleridae (Coleoptera), I, II (*Indian Forest Rec., 12 (1926), No. 8, pp. 209–231*).—The first part of this account (pp. 209–216) reports on New Species of Cleridae from British India and Burma, by J. B. Corporaal, and the second part (pp. 217–231) consists of Notes on the Biology of the Cleridae, by C. F. C. Beeson.

A foreign cabbage flea-beetle in the United States, F. H. Chittenden (*Ent. Soc. Wash. Proc., 28 (1926), No. 6, pp. 139–141*).—The author records the occurrence of *Phyllotreta aerea* Allard at Rochester, N. Y., where it was found destroying seedling radishes and cabbage. The species inhabits the southern and south-central portions of Europe, where it now and then is destructive to the cruciferous crop plants.

On the five species of Dendrolimus injurious to conifers in Japan, with their parasitic and predacious insects, S. Matsumura (*Jour. Col. Agr., Hokkaido Imp. Univ., 18 (1926), No. 1, pp. 42, pls. 5*).—In this contribution the author deals with five species of the lepidopterous genus Dendrolimus, namely, *D. spectabilis* Btlr. and *D. punctatus* Wk., which are injurious to pine trees exclusively; *D. albolineatus* Mats., which is the most injurious; and *D. superans* Btlr. and *D. jezoensis* Mats. Accounts are included of 29 hymenopterous and 4 dipterous parasites reared, 24 of which are described as new, and of 11 predacious insects which are beneficial in exterminating *D. albolineatus* Mats. in Saghalien and the Kurile Islands, 1 of which is described as new.

Control of bark beetles on the national forests, J. F. Preston (*Jour. Forestry, 23 (1925), No. 1, pp. 49–61*).—This is a contribution from the U. S. D. A. Forest Service, dealing with the subject under the headings of classification of insect work, cycles, life history, recognizing epidemic conditions, scouting, methods of checking, difficulties of control in the national forests, methods of control, the percentage theory, the Kaibab theory of control, when is control justified, records of past control work, insect losses, and the ultimate solution.

Dusting cotton with calcium arsenate for boll weevil control.—Progress report, J. M. Robinson (*Alabama Sta. Circ. 51 (1926), pp. 12, figs. 3*).—This reports upon cotton dusting tests made during 1924 and 1925 on sandy loam, Cecil clay, and Houston clay. It is concluded that a dust application just before the cotton begins to square is advisable, providing there are 20 or more weevils per acre. The time to begin dusting to protect the young

squares is when the infestation reaches 10 per cent, three dustings at intervals of four or five days being sufficient to reduce the infestation.

At the station the average increase in yield from dusting in 1924, when the weather conditions were favorable, was 204 lbs. of seed cotton per acre, while in 1925, with the rainfall below and the temperature above normal, the average increase was 37 lbs. of seed cotton. The yield per acre on heavy red soil on a farm in Lee County was 85 lbs. less on the dusted than on the undusted plat in 1924, as a result of a drought in July which caused the shedding of young bolls. There was an increase of 280 lbs. of seed cotton per acre on the dusted plat in 1925. On Houston clay, on a farm located in the Black Belt near Montgomery, the increase in yield in 1924, when the weather caused the shedding of bolls on the plats, was 170 lbs. of seed cotton per acre. On another farm in Montgomery County with Houston clay soil the increased yield on the dusted plat in 1925 was 420 lbs. of seed cotton per acre. It was found that 36 lbs. of calcium arsenate will make six applications per acre. The average cost of dusting was $7.25 per acre.

The Thurberia cotton boll weevil, C. HAYDEN (*Cong. Rec., 67 (1926), No. 168, pp. 12313–12319*).—Included in this discussion of the Thurberia boll weevil are statements made by C. L. Marlatt and B. R. Coad on investigations of the pest in Arizona.

Bee diseases in Ontario, F. E. MILLEN (*Ontario Dept. Agr. Bul. 317 (1926), pp. 22, figs. 15*).—A revision of Bulletin 276, previously noted (E. S. R., 47, p. 856).

Some new Porto Rican scale parasites (Hymenoptera: (Encyrtidae), H. L. DOZIER (*Ent. Soc. Wash. Proc., 28 (1926), No. 5, pp. 97–102, figs. 4*).—Under the names *Mercetiella reticulata* n. g. and n. sp. and *Euaphycus portoricensis* n. sp. the author describes two primary parasites of the pustule scale (*Asterolecanium pustulans*), a very destructive enemy in the West Indies of the fig, *Cassia fistula*, silver oak (*Grevillea* sp.), oleander, mulberry, and many other trees and shrubs. *Acerophagus nubilipennis* reared from *Pseudococcus aonidum* on elephant ear and from the citrus mealybug, at Rio Piedras, P. R., is also described as new.

A study of ants in their relation to the growing of pineapples in Hawaii, J. F. ILLINGWORTH (*Hawaii. Pineapple Canners' Sta. Bul. 7 (1926), pp. 16*).—The increasing number of ants in Hawaiian pineapple fields led to the investigations here reported, from which the author concludes that they are a source of more benefit than harm in pineapple fields. With the closest observations of ants, he has never found them eating living roots of the pineapple. *Pheidole megacephala* Fab. is said to be fast becoming the predominant ant in the lower levels of the Hawaiian Islands, but climatic conditions in some of the pineapple sections are so severe that it has not yet taken possession to the extinction of other species, as is the case in and about Honolulu. Notes are also presented on *Solenopsis geminata rufa* Forel, *Prenolepis longicornis* Latr., *P. bourbonica* Forel, *Tapinoma melanocephalum* Fab., *Camponotus maculatus* Fab., *Plagiolepis mactavishi* Whlr., *Cardiocondyla nuda* Mayr., *C. wroughtoni* Forel, *Monomorium minutum* Mayr., *Tetramorium guineense* Fab., *Ponera kalakauea* Forel, and *Leptogenys falcigera* Roger.

Arachnidism: A study in spider poisoning, E. BOGEN (*Jour. Amer. Med. Assoc., 86 (1926), No. 25, pp. 1894–1896*).—The author points out that *Latrodectus mactans* is probably the only poisonous spider in the United States, where it has many popular names. He reviews 150 cases of spider poisoning previously reported, reports upon 15 additional cases treated at the Los Angeles General Hospital, and discusses the treatment applied. In the 15 cases reported, most of the bites occurred after dark, in the late summer and early fall.

Constant findings in arachnidism include a history of a bite by a black spider, followed by excruciating pain, mainly in the legs and abdomen, extreme abdominal rigidity, high blood pressure, elevation of temperature, and a polymorphonuclear leukocytosis. Large doses of opiates and the application of heat are the main symptomatic remedies, but convalescent serum appears to be of specific therapeutic value.

Ticks: A monograph of the Ixodoidea.—IV, The genus Amblyomma, L. E. ROBINSON (*Cambridge: Univ. Press, 1926, pt. 4, pp. XII+302, pls. 8, figs. 130*).—In this part of the monograph previously noted (E. S. R., 35, p. 263), the author describes 86 definitely established species of Amblyomma. The work includes a classified list of hosts of species of the genus (pp. 267–274); the geographical distribution of the genus (pp. 275, 276); a list of references (pp. 277–281); an index to valid species of the genus, with synonyms, doubtful, and condemned species (pp. 282–284); and notes on the biology of Amblyomma (pp. 285–302).

ANIMAL PRODUCTION

Studies of the thyroid apparatus.—XXIX, The rôle of the thyroid apparatus in growth, F. S. HAMMETT (*Amer. Jour. Physiol., 76 (1926), No. 1, pp. 69–91, figs. 4*).—In continuing this series (E. S. R., 53, p. 572) the data showing the effect of thyroparathyroidectomy and parathyroidectomy at 23, 30, 50, 65, 75, and 100 days of age on the growth in body weight of male and female rats have been combined and analyzed. The author draws the following conclusions:

"The rôle of the thyroid in growth is that of a participant in the regulation of the metabolic level through which is determined the rate of the maintenance processes of the organism and hence the amount of material presented to the cells for growth purposes during a given period. It is therefore a determinant of the capacity factor in growth. Catalysts other than those produced by the thyroid are concerned in the determination of the intensity factor in growth. The thyroid is more largely concerned in growth by increase in cell mass than in growth by increase in cell number. The parathyroids are not concerned in growth except in so far as they protect the organism from the growth-retarding influences exerted by toxic products resulting from parathyroid deficiency. The retardation of growth which obtains is largely attributable to a lowering of the nutrient level following a disturbance in effectiveness of the digestive system due to the response of the sympathetic system to the toxemia. Puberty has an influence upon the growth response to the glandular deficiencies. This influence originates in gonadal incretory development and is expressed as an increase in the call for growth materials. The fact of most significant biological interest is the demonstration of the stability of the intensity factor of growth under adverse conditions and the remarkable power of the organism to adjust itself in this respect."

Studies of the thyroid apparatus.—XXX, The relation between age at initiation of and response of body growth to thyroid and parathyroid deficiency, F. S. HAMMETT (*Endocrinology, 10 (1926), No. 1, pp. 29–42, figs. 3*).—This paper gives the combined results of earlier studies (see above), showing the comparative growth in body weight and length and tail length for the two sexes and for operated and control animals from the time of parathyroidectomy or thyroparathyroidectomy at 23, 30, 50, 65, 75, and 100 days of age to 150 days of age.

The evidence indicates that the retardation of growth was greater in the rats operated on at the more advanced ages. The glandular deficiencies

tended to retard growth in body weight more than growth in body length and tail length. Thyroid deficiency retarded growth more than parathyroid deficiency. The growth of the male appears to be less dependent upon the functions of the thyroid, while that of the female is less dependent upon the parathyroid, though puberty is a significant factor in the growth response to thyroid and parathyroid deficiency.

Studies on the oestrous cycle in the rat.—II, The effect of thyroparathyroidectomy and parathyroidectomy, M. O. Lee (*Endocrinology, 10 (1926), No. 1, pp. 43–55*).—In continuing this series (E. S. R., 55, p. 331) observations on the length of the oestrous cycle as determined by vaginal smears are reported for 26 thyroparathyroidectomized females and 11 parathyroidectomized females. The length of the oestrous cycle was increased an average of 25 per cent as a result of the former operation and 12 per cent as a result of the latter operation, but these effects are considered as due to the influence of the removal of the glands on metabolism and general health rather than to a specific effect of the lack of secretions of the glands on ovarian activity. Similar results, to some extent, followed sham operations.

Studies on vigor.—VII, The fatigability of castrated rats, M. Gans and R. G. Hoskins (*Endocrinology, 10 (1926), No. 1, pp. 56–63, figs. 2*).—In continuing this series (E. S. R., 55, p. 227), the results of a study of the strength and fatigability of the gastrocnemius muscle of 15 castrated and 15 normal rats are reported. The results showed that the individual muscles were heavier in the castrated animals, but that the strength per gram and the proportion of the weight of the muscle to the body weight were similar in both groups. The muscles of the castrated animals were able to perform considerably less work than those of the controls, which is ascribed to an inadequacy of supporting functions such as respiration and circulation.

Effect of castration upon pulling power and endurance in guinea pigs, M. D. Sumulong (*Philippine Jour. Sci., 29 (1926), No. 3, pp. 327–339*).—In continuing the study at the University of the Philippines of the effects of castration on the guinea pig (E. S. R., 54, p. 562), the pulling power and endurance of castrated and noncastrated guinea pigs at 16 to 57 weeks of age from the same litters were compared. The results showed that the guinea pig can pull on a level surface a load averaging 68 per cent heavier than the animal's body weight, irrespective of age. Castration when performed either before or after puberty appeared to have no effect on pulling power. The endurance of the guinea pigs was tested in swimming, fatigue being considered as the time when the animals remained in a perpendicular position with just the nose sticking above water. The endurance of the castrated animals appeared to be equal to that of the controls.

Physiological ontogeny: A, Chicken embryos.—VII, The concentration of the organic constituents and the calorific value as functions of age, H. A. Murray, Jr. (*Jour. Gen. Physiol., 9 (1926), No. 4, pp. 405–432, figs. 10*).—Analysis of the fresh and dry weights of chick embryos at 5 to 19 days of incubation produced from the eggs of White Leghorn hens 8 to 12 months of age, in continuation of work previously noted (E. S. R., 54, p. 766) showed that the percentage of dry matter of the embryos increased from 5.32 to 17.44 per cent during the portion of the incubation period studied. The nitrogen content remained relatively constant, while the fat content increased from 13.0 to 31.5 per cent. The glycogen content increased considerably during the second and third quarters of the period studied, but the maximum was only 0.08 per cent, making glycogen a negligible factor in the determination of the calorific value. Both bomb calorimeter determinations and estimations from the nitrogen and fat content indicated that the calorific value per gram of dry

substance increased with age, but the course of the two curves was slightly different. The ash content of the embryos was greatest during the early stages of development, followed by a decrease to near the time of hatching, with a subsequent increase as hatching approached.

Various theoretical discussions of the rate of absorption and synthesis of the different substances are presented.

Silage investigations at Bangor, E. J. Roberts (*Welsh Jour. Agr., 2 (1926), pp. 163–168*).—Various reasons for the desirability of silage as compared with roots are pointed out. The results of a comparative feeding test of silage and roots with 16 pregnant heifers showed no significant difference in the weights of the animals. In this experiment 30 lbs. of silage replaced 30 lbs. of roots, 6 lbs. of straw, and 1 lb. of concentrates.

Feeding experiments with by-products from cornstarch production [trans. title], J. Hansen, W. Dietrich, and H. Vogel (*Züchtungskunde, 1 (1926), No. 1, pp. 28–46*).—The authors report the results of feeding experiments in which by-products designated as corn feed, corn oil cake meal, and corn protein feed from cornstarch manufacture have been fed to dairy cattle and swine.

In the experiments with dairy cattle 2 lots of 5 cows each were fed in 2 experiments, each of which consisted of 3 14-day periods. In the first and third period of each test the cows received a basal ration of 15 kg. of meadow hay, 60 kg. of fodder beets, 2 kg. of rape cake, and 2 kg. of ground soy beans per 1,000 kg. of live weight. In the second period of the first trial 3 kg. of corn feed replaced 2 kg. of the rapeseed cake and 6 kg. of beets, and in the corresponding period of the second trial 3 kg. of corn oil cake replaced 2 kg. of rapeseed cake and 14 kg. of beets. The results showed that the cows more than maintained their weight when the corn by-products were included in the ration, and the milk production was slightly increased as compared with the average of the control periods. The two corn by-products used in these experiments are thus considered to be satisfactory for milk production.

In the experiments with swine 6 lots of 4 pigs each, ranging in live weight from 55 to 83 kg., were fed in pairs on corn feed, corn oil cake meal, and corn protein feed until an average weight of approximately 100 kg. was attained. All of the lots received sufficient of one of the three corn by-products to supply 200 gm. of protein per head daily, and the remainder of the necessary nutrients was obtained from potato flakes or fresh potatoes. During the test period the two lots receiving corn feed made an average daily gain per head of 0.476 kg., as compared with 0.542 kg. for those on corn oil cake and 0.532 kg. on corn protein feed. The average dressing percentages of the 3 groups were, respectively, 75.2, 75.2, and 75.5 per cent. A study of the general results and the feed requirements per unit of gain indicated that it was not possible to supply the necessary amount of protein for fattening swine from the corn feed or the corn oil cake when fed with potatoes.

Use of molasses and sugar products for stock feeding [trans. title], M. Bernard (*Jour. Sta. Agron. Guadeloupe, 5 (1925), No. 3, pp. 129–137; trans. in Planter and Sugar Manfr., 76 (1926), No. 14, p. 267*).—Essentially a description of various molasses feeds, with a discussion of their uses and limitations in the feeding of animals.

Commercial feeding-stuffs (*Med. Univ. Quart. No. 117 (1926), pp. 87*).—This is the usual report of the guaranteed and found analyses for protein, fat, and fiber, and the identification of the ingredients of the commercial feeding stuffs officially inspected during the calendar year 1925.

Is the antirachitic factor of cod liver oil, when mixed with ground grains, destroyed through storage? E. B. Hart, H. Steenbock, and S. Lepkovsky (*Jour. Biol. Chem., 65 (1925), No. 3, pp. 571–578, pl. 1*).—The results are

given of two experiments, conducted at the Wisconsin Experiment Station, dealing with the effect of mixing cod-liver oil with a basal ration of 97 parts of yellow corn, 2 parts of calcium carbonate, and 1 part of sodium chloride and storing the ration for 3 or 6 months on the potency of the antirachitic vitamin. Five lots of chicks were used in each experiment. Skim milk was supplied ad libitum. In both experiments 1 lot received the basal ration; 2 lots received the basal ration plus 0.5 or 1 per cent of cod-liver oil which had been mixed and stored for 3 or 6 months at room temperature; and the other 2 lots received similar rations except that the feeds were freshly mixed with the cod-liver oil every 8 days. The chicks were fed for 5 to 6 weeks without access to sunlight, after which they were killed and the tibiae dissected and the ash content and calcification determined.

The results showed that the ash content of the bones of the chicks receiving the basal ration averaged 38.8 per cent in one experiment and 40.1 per cent in the other, and the calcification was described as poor (silver nitrate test). Storing the mixed ration did not appear to have any effect on the potency of the antirachitic vitamin, as the ash content of the tibia averaged 46.4 per cent in the lots receiving the ration containing 0.5 per cent of cod-liver oil stored for 3 and 6 months, and 44.8 and 45.7 per cent, respectively, in the lots receiving the same ration freshly prepared. The ash content of the bones of the chicks receiving the ration containing 1 per cent of cod-liver oil and stored for 3 and 6 months was, respectively, 50.1 and 46.9 per cent, as compared with 47.6 and 49.7 per cent for the chicks receiving the freshly mixed ration containing 1 per cent of cod-liver oil.

Calcification was described as somewhat better in the lots receiving 1 per cent of cod-liver oil either stored or freshly mixed than in those receiving 0.5 per cent of cod-liver oil. Symptoms of leg weakness were evident in the control lots, but no such symptoms were observed in the other pens.

Nutrition studies with beef steers (*New Hampshire Sta. Bul. 221 (1926), pp. 9, 10*).—In continuing the study of the effect of environmental temperature on heat metabolism in beef steers (E. S. R., 51, p. 868), in cooperation with the Carnegie Institution of Washington, two kinds of rations, namely, timothy hay and alfalfa hay, have been used in both maintenance and submaintenance amounts. The preliminary results indicate that the influence of temperature on heat production was not so great as was anticipated. Heat production determined indirectly was invariably lower on alfalfa than on an equal quantity of timothy hay.

[Steer feeding investigations at the Caldwell Substation] (*Idaho Sta. Bul. 142 (1926), p. 14*).—The results of an experiment with 2-year-old steers indicated that alfalfa meal was markedly superior to long and cut alfalfa, and that cut alfalfa showed little advantage over long alfalfa. Corn was superior to barley, and favorable results accompanied the feeding of corn silage, 1,087 lbs. of which replaced 661 lbs. of alfalfa and 356 lbs. of corn when fed with corn and alfalfa hay.

Baby beef on skim milk, W. Toole (*Ontario Dept. Agr., Agr. and Expt. Union Ann. Rpt., 47 (1925), p. 36*).—In a test to determine the possibility of producing a good quality of baby beef with skim milk, 4 grade Shorthorn calves, which had received no whole milk after 3 weeks of age, were marketed at about 12 months of age, when weighing approximately 800 lbs. each. These animals had made an average daily gain per head of 1.96 lbs., and were reported as well finished. It is noted that good beef calves are necessary for the production of baby beef from skim milk.

Grading up beef cattle at Sni-a-Bar Farms, D. S. Burch et al. (*U. S. Dept. Agr., Misc. Circ. 74 (1926), pp. II+28, figs. 20*).—An account is given of the results obtained in the first 10 years of the demonstration of the improvement

in a herd of ordinary red cows produced by mating with purebred Shorthorn bulls in successive generations. A large portion of the circular deals with the description of a typical visit to one of the annual demonstrations.

Blue-grey cattle, C. B. Jones (*Welsh Jour. Agr., 2 (1926), pp. 73–81*).—The results are given of two experiments conducted at the University College of Wales to compare the relative merits of blue-gray cattle sired by a white Shorthorn bull from high-grade Galloway and Welsh heifers. Six heifers of each of the breeds were used in both of the experiments, each of which began at the time of breeding and continued until the calves were slaughtered at over two years of age. The weights of the individual animals were recorded at 28-day intervals from weaning until slaughtering. The two kinds of blue-grays were quite similar in many respects, but on the whole those from the Welsh cows were probably not quite equal to those from the Galloways, although they were considerably better milkers.

Sheep breeding (*New Hampshire Sta. Bul. 221 (1926), p. 9*).—A progress report of the breeding work with three groups of sheep is presented (E. S. R., 51, p. 129).

The average fecundity of the Southdown × Rambouillet crosses was 170 per cent, of the Rambouillet × Oxford flock 182 per cent, and of the Bell flock 127 per cent. The average live weights of the lambs at 3.5 months of age in the respective flocks were 61, 65, and 62 lbs., and the fleece weights 8, 9, and 7 lbs. The characteristics of the fleeces were ½, ⅝, and ¼ staple, and the number of nipples 2, 2, and 4–6 in the respective flocks.

[Lamb feeding investigations at the Aberdeen Substation] (*Idaho Sta. Bul. 142 (1926), p. 14*).—In tests of the feeding value of alfalfa screenings, 193 lbs. of screenings replaced 249.9 lbs. of alfalfa hay and 144.5 lbs. of barley.

Swine feeding experiments, J. M. Scott (*Florida Sta. Rpt. 1925, pp. 16–18*).—Studies of the comparative value of different protein supplements for swine feeding were continued (E. S. R., 54, p. 367).

Skim milk as a hog feed.—In this experiment 2 lots of 8 hogs each, averaging approximately 180 lbs. in live weight, were fed for 61 days on a ration of shelled corn and fish meal (9:1). In addition one lot was supplied with skim milk. This supplement to the ration increased the average daily gain per head from 1.48 to 1.88 lbs., and reduced the total amount of grain required to make 100 lbs. of gain by 64.9 lbs.

Dried buttermilk as a feed.—In this experiment 4 lots of 8 pigs each, averaging approximately 100 lbs. in weight, were fed for 61 days on a ration of shelled corn with supplements in lot 1 of fish meal and skim milk, in lot 2 fish meal and dried buttermilk, lot 3 fish meal and shorts, and lot 4 shorts. The results from feeding skim milk and dried buttermilk were practically equal, the average daily gains being 1.15 and 1.12 lbs. When shorts replaced the milk protein as a supplement to corn and fish meal the average daily gain was only 0.83 lb., and when shorts was the sole supplement to the shelled corn the average daily gain was 0.59 lb. It was also found that the addition of 5 per cent of fish meal to the ration of corn and shorts saved 155.7 lbs. of grain per 100 lbs. of gain.

Fish meal v. meat meal.—A ration of shell corn and fish meal (9:1) was compared with shelled corn and meat meal (9:1.33), using 2 lots of 9 hogs each during a 30-day feeding period. The results showed that the pigs, which averaged approximately 80 lbs. in live weight, made an average daily gain of 0.7 lb. on the ration of corn and fish meal, and 0.42 lb. on the ration of corn and meat meal. The estimated amounts of feed required per unit of gain were 50 per cent larger on the latter ration.

Fish meal, meat meal, and cottonseed meal.—In this experiment 2 lots of 9 hogs each, averaging approximately 100 lbs., were fed on rations of shelled corn and fish meal (9:1), and shelled corn and a mixture of equal parts of meat meal and cottonseed meal (9:1.33). These results indicated that a mixture of meat meal and cottonseed meal produced better gains than meat meal alone as supplements to corn. The hogs receiving the ration of corn and fish meal made an average daily gain of 0.78 lb., and those receiving the combined supplement of meat meal and cottonseed meal an average gain of 0.88 lb.

[Swine feeding experiments at the Idaho Station] (*Idaho Sta. Bul. 142* (*1926*), *pp. 14, 15*).—Sows receiving Canadian field peas farrowed 63 pigs averaging 2 lbs. in live weight at birth, while other sows receiving a ration of barley, oats, corn and alfalfa hay farrowed 85 pigs averaging 2.5 lbs. A considerably larger percentage of the pigs from the sows of the check ration were classified as very strong.

The influence of sunlight on bone development in swine, L. A. Maynard, S. A. Goldberg, and R. C. Miller (*Jour. Biol. Chem., 65* (*1925*), *No. 3, pp. 643–655*).—The results of two experiments relating to the development of bone in swine are reported from the New York Cornell Experiment Station. In each experiment lots of 4 pigs each were fed on a basal ration of 200 parts of yellow corn, 100 parts of wheat middlings, and 75 parts of oil meal. This ration was found in earlier experiments to produce a characteristic stiffness in pigs when fed without access to sunlight (E. S. R., 54, p. 469).

In the two experiments reported one lot in each was confined indoors, while another lot was allowed free access to direct sunlight, which averaged 8.96 hours daily in one trial and 4.87 hours in the other. In the first trial an additional lot of pigs received the basal ration supplemented with bone meal and ground limestone.

The results showed that all the pigs fed the basal ration without access to direct sunlight developed the characteristic stiffness within 4 months in both trials, while 7 of the 8 pigs receiving the same ration but allowed access to sunlight showed no signs of trouble within the same period. Determinations of the ash content of the bones indicated that sunlight materially aided the deposition of minerals in the bones. The average ash content of the femurs of the 8 pigs in the no-sunlight group for the two experiments was 14.41 ± 0.701 per cent, while the average for 7 of the 8 pigs in the sunlight group was 18.28 ± 0.257 per cent.

Histological examinations of the bones were in agreement with the chemical analyses, showing that more nearly normal bone was produced in the pigs which had been exposed to sunlight. Supplementing the ration in the first experiment with bone meal and ground limestone increased the ash content and made the bones more nearly normal histologically, but in all groups the bones were below normal, as judged by comparison with the bones of pigs fed a ration rich in minerals and on pasture in earlier experiments. Certain irregularities of findings in individual animals are pointed out and briefly discussed.

Recent research in pig feeding, J. Golding (*Welsh Jour. Agr., 2* (*1926*), *pp. 159–163, pl. 1*).—A brief account is given of the results of experiments conducted at the National Institute for Research in Dairying, Reading, dealing with the effect of vitamin A and D deficiencies on swine. When a ration of toppings, caseinogen, olive oil, chalk, and charcoal was given, the total gain was reduced to 1.5 to 4.5 lbs. per head during the 85 days. Similar pigs gained 29 lbs. in the same period when cod-liver oil replaced the olive oil and animal charcoal replaced the wood charcoal. True rickets was not observed in the former lot, though the pigs went off their feet.

In another experiment a ration of toppings, dried skim milk, barley meal, animal charcoal, and chalk produced good growth, but within 2 or 3 months the 10 pigs were off their feet and histological examinations showed the presence of true rickets in 8 of the 10 animals. This condition was corrected in other pigs by adding 0.25 to 0.5 oz. of cod-liver oil to the daily ration, by replacing the skim milk with full cream milk, or by allowing the pigs access to direct sunlight.

[Investigations with swine], W. TOOLE (*Ontario Dept. Agr., Agr. and Expt. Union Ann. Rpt., 47 (1925), pp. 33–36*).—In a comparative study of the skeleton of the champion Yorkshire barrow at the 1923 Royal Agricultural Winter Fair and a lard type of hog of similar weight, many differences were observed, but one of the most obvious was the fact that the bacon hog had 15 pairs of ribs and the lard hog had 14 pairs. In further studying the differences in the number of ribs in swine, records were obtained on over 90 hogs from a single carload. Of these, 5 had 14 pairs of ribs, 60 15 pairs, over 20 16 pairs, and 1 had 17 ribs on one side and 16 on the other side.

Further studies of conformation have been conducted to ascertain the relation between the length of intestine and the rate of gain, but so far no direct correlation has been observed.

In another experiment to determine the effect of oats on the production of soft pork, 25 pigs were divided into 5 lots with different rations. The rations of the different lots included various combinations of oats, barley, and middlings, with and without tankage, green feed, and minerals. At the end of the feeding period the hogs were slaughtered and records of the quality of the carcasses obtained. Notwithstanding the fact that various authors in Great Britain have stated that oats and middlings were likely to produce soft pork, 32 of the sides graded firm and 18 graded very firm, 6 of the latter coming from the lot that was finished on oats alone, and 6 from the lot finished on oats, middlings, and green feed.

A comparison of Scandinavian and British pig breeding methods, I–III, H. R. DAVIDSON (*Jour. Min. Agr. [Gt. Brit.], 32 (1926), Nos. 10, pp. 920–928, pl. 1; 11, pp. 1019–1025, pl. 1; 12, pp. 1102–1110, pl. 1*).—These articles discuss the Danish, Swedish, and British methods of swine breeding, including criticism and suggestions for improvement.

The normal oestrous cycle in the sow, F. F. MCKENZIE (*Missouri Sta. Research Bul. 86 (1926), pp. 5–41, figs. 11*).—The changes in the histological structure of the vestibule, vagina, uterus, and ovaries of 12 sows killed at various stages of the oestrous cycle, and on which observations of oestrum had been previously made by periodic smears of the contents of the vagina and vestibule, and the reaction of the sows to boars, were studied. All stages in the cycle were represented in the animals killed.

The duration of the oestrous cycle in the different animals varied from 18 to 25 days, and the heat period lasted from 1 to 3 days. The changes in the appearance of the external genitalia and the contents and histology of the internal genitalia during dioestrum (eighth to fifteenth day), prooestrum (sixteenth to eighteenth day), early oestrum (nineteenth day), late oestrum (twentieth day), and metoestrum (first to seventh day) are tabulated.

Ovulation evidently occurs during oestrum, which is accompanied by a heavy sloughing of the epithelial cells of the genital tract.

Fall litters, G. B. ROTHWELL (*Canada Dept. Agr. Pamphlet 63, n. ser. (1926), pp. 8, figs. 4*).—An outline for swine management in the production of fall pigs in Canada.

Guide to the production of swine on Bavarian farms [trans. title], N. Teiner ([*Czechoslovakia*] *Min. Landw. Pub. 60* (*1925*), *pp. 79, figs. 28*).—This deals with the methods of breeding, feeding, management, housing, and diseases of swine, including descriptions of various breeds.

Curing meat in North Carolina, E. H. Hostetler and L. H. McKay (*North Carolina Sta. Bul. 249* (*1926*), *pp. 1–9, figs. 3*).—The shrinkage of hams, sides, and shoulders of pigs which were full-fed in dry lot, or fed on pasture with or without limited grain rations, followed by finishing in dry lot, is reported for 8 groups of pigs. The grazing crops consisted of soy beans and peanuts.

The average results of all trials showed that the pork from the pigs fed a limited ration with peanut pasture shrank the least during curing and storing.

In one group of 4 trials the largest shrinkage occurred in the lots which had received soy bean pasture, while in the other group of 4 trials the shrinkage was greater in the pork from the hogs which had been fed in dry lot.

The influence of curing with dry salt or with brine is noted on page 889.

The body development of Holstein cavalry horses from birth to the cessation of growth [trans. title], E. Iwersen (*Züchtungskunde, 1* (*1926*), *No. 3, pp. 134–143, figs. 5*).—Average body measurements of 12 different regions are presented in tables for 140 males and 167 females, ranging in age from birth to 5 years and older.

[Experiments with poultry at the Idaho Station] (*Idaho Sta. Bul. 142* (*1926*), *p. 20*).—The results of five years' experiments have indicated that sour skim milk is most satisfactory for the production of large numbers as well as large sized eggs. This substance may be profitably used as a supplement to the basal ration when fed in unlimited amounts alone or with pea meal, bean meal, meat meal, or fish scrap. It is concluded that when sour skim milk is supplied in unlimited amounts vegetable or other animal protein supplements should be added to the mash only when they cheapen or do not materially increase the cost of the ration.

With sour skim milk the average production was 46 per cent, and 45.2 per cent of the eggs weighed between 24 and 28 oz. per dozen. The average feed consumption was 41.4 lbs. of grain, 19.4 lbs. of mash, and 164.6 lbs. of sour skim milk in this experiment.

Cod-liver oil proved slightly more valuable as a source of vitamins than lawn clippings, though both pens gave higher production, higher hatchability, and less mortality than the pens getting no green feed, or dry yeast and no green feed.

The use of artificial illumination on New Jersey poultry farms, W. H. Allen (*New Jersey Stas. Hints to Poultrymen, 14* (*1926*), *No. 12, pp. 4*).—Data based on questionnaires are presented showing the November to April production in 286 New Jersey poultry flocks. The flocks have been grouped according to the practice with reference to the use of electric lights. The average production per bird was 67.1 eggs for the flocks using no lights and 75.8 eggs where lights were used.

When lights were supplied for 1 hour late in the evening in the so-called "evening lunch" system the production averaged 71.9 eggs as compared with 77.2 when the day was lengthened to 12 hours by morning lights, and 75.9 eggs when the length of day was made similar by the use of both morning and evening lights.

Various factors related to the artificial lighting of poultry houses are discussed.

The nutritional requirement of the chicken.—V, The influence of ultra-violet light on the production, hatchability, and fertility of the egg, E. B. HART, H. STEENBOCK, S. LEPKOVSKY, S. W. F. KLETZIEN, J. G. HALPIN, and O. N. JOHNSON (*Jour. Biol. Chem., 65 (1925), No. 3, pp. 579–595, fig. 1*).—In continuing this series of studies at the Wisconsin Experiment Station (E. S. R., 52, p. 173), four lots of yearling White Leghorn hens were employed for determining the effect of ultra-violet light on the production, hatchability, and fertility of the eggs. All four lots were fed without access to direct sunlight on a basal ration of mixed grains and minerals, with skim milk ad libitum. One of the lots received 10 minutes' exposure daily to ultra-violet light, and the basal ration of another lot was supplemented with 5 parts of dried pork liver. The male birds used were not irradiated, except in one of the lots receiving the basal ration only.

The experiment was started on January 1, and by April 15 it was evident that egg production was much higher in the lot receiving the ultra-violet light treatment, and that all the other lots were suffering from rickets. After this period one of the control lots received 10 minutes' exposure daily to ultra-violet light, and the ration containing pork liver was supplemented with cod-liver oil. This change resulted in a material increase in egg production, particularly in the former lot. Blood analyses made before the change in the ration showed that the inorganic phosphorus content was much higher in the birds receiving exposure to ultra-violet radiation.

The percentage of fertile eggs in the four lots showed only slight differences, there being a little larger percentage in the irradiated pen. The hatchability of the eggs from the nonirradiated pens was low at the start and decreased to 0 in April and May, while the eggs from the irradiated birds maintained a hatchability above 60 per cent throughout. Where the male was irradiated the hatchability was better than in the other basal nonirradiated pens.

The dried weights of the eggs, the egg shells, egg whites, and whole eggs from the irradiated birds were on an average heavier than from the nonirradiated birds. The percentage of calcium oxide in the shells and whites from the two groups was similar, but it was slightly greater in the yolks from the irradiated birds. The content of phosphorus was also slightly higher in the yolks of the eggs from the latter group.

Analyses of the chick embryos at hatching time showed that chicks from nonirradiated hens' eggs contained only about one-half as much total calcium as chicks from irradiated hens' eggs. The difference is suggested as due to the deficiency of the antirachitic vitamin in the embryo, which aids in transferring the calcium from the egg shell for bone formation. Tests with rats of the potency of the egg yolks in vitamin B showed that the yolks of eggs from the irradiated birds were practically ten times as potent as those from the nonirradiated birds.

Further experiments showed that the direct exposure of eggs to ultra-violet radiation for 1 to 40 minutes had no effect on the hatchability, indicating that the radiation did not penetrate the shell.

Irradiation of chicks with cod liver oil, C. W. CARRICK (*Amer. Jour. Physiol., 74 (1925), No. 3, pp. 534–538, figs. 2*).—In experiments at the Indiana Experiment Station two groups of newly hatched chicks were fed on a ration of 80 gm. of ground yellow corn and 20 gm. of wheat middlings, with buttermilk ad libitum. Pyrex flasks containing cod-liver oil were placed in the feed troughs and among the birds of one lot. The results showed that rickets occurred in both lots, but 6 of the 15 original chicks were still living at 7 weeks of age in the irradiated lot. All of the 7 nonirradiated birds died within 34 days. It is concluded that the antirachitic substance in cod-liver oil may be

transmitted by means of irradiation through Pyrex flasks, and further that the antirachitic substance in cod-liver oil is some form of ultra-violet energy.

The feeding value of "protozyme" for poultry, M. Decker and F. H. Clickner (*New Jersey Stas. Hints to Poultrymen, 15 (1926), No. 1, pp. 4, fig. 1*).—The results of tests of the effect of adding 1, 2, 3, and 5 per cent of protozyme to a basal ration of wheat bran, wheat middlings, corn meal, ground oats, and meat scrap on the growth of baby chicks and the egg production of the pullets are briefly reported.

In one year's test with pullets the birds receiving the protozyme produced larger numbers of eggs than birds on the check ration. The highest production was obtained with 3 per cent protozyme, but weight was maintained better in birds receiving 5 per cent of the supplement. Supplementing the basal ration of chicks, which included the above feeds plus skim milk, with this substance, lowered the mortality and increased the rate of growth.

Calcium and phosphorus content of strong and weak chicks from hens with and without calcium carbonate in their diet, G. D. Buckner, J. H. Martin, and A. M. Peter (*Amer. Jour. Physiol., 76 (1926), No. 1, pp. 28–34*).—In continuing the studies of calcium metabolism in poultry at the Kentucky Experiment Station (E. S. R., 54, p. 165), 3 lots of 10 Leghorn hens each were given rations consisting of wheat and yellow corn with buttermilk ad libitum. Lot 1 was allowed grass range and given oyster shells, while lots 2 and 3 were confined, though lot 2 also received oyster shells. The experimental feeding started on January 1, and eggs were saved for hatching beginning March 1, when the average weights of the dry shells of the eggs from lots 1, 2, and 3, respectively, were 6.2, 5.7, and 3.9 gm. At hatching time the chicks were classified as weak or strong, depending upon their vigor and vitality. They were then killed, dried, and analyzed for calcium and phosphorus.

The results show that the weights of the eggs, shells, and egg contents, and the dry weights of the chicks were notably heavier when the hens received the calcium carbonate supplement, but no weak chicks were produced from the eggs of hens in lot 3, though they were less vigorous than those in the other lots.

The analyses of the chicks show that the phosphorus content was practically the same in weak and strong birds, but that the calcium content was less in the weak chicks, making their ratio of calcium to phosphorus lower. The strong chicks of lot 1 contained relatively more calcium than the strong chicks of the other lots, indicating that the range supplied something which was not available to the confined birds. It was also found that the chicks hatched from hens receiving range also took more calcium carbonate from the shell of the egg than chicks hatched from eggs produced by the other lots.

Effect of ovarian injury on egg laying in fowls, M. Steggerda (*Abs. in Anat. Rec., 31 (1925), No. 4, pp. 355, 356*).—In studies of the effect of ovarian injury on egg production, the ovaries of 50 fowls were mutilated or portions were removed, while 50 similar birds were kept as controls. The operation appeared to cause greater variability in egg laying, and the highest and lowest producing birds were among the operated fowls. The highest third of the producers in the two lots averaged 187 eggs for the operated fowls and 168 for the control birds, and among the third which were the lowest producers in each group, the operated birds laid an average of 92 eggs, while the controls laid 108 each. From these results it is concluded that the operation produces a stimulating effect in some cases on egg production, while in others the physiological condition is so disturbed that egg laying is impaired. Weights, mortality, fertility, broodiness, and the dates of laying the first eggs did not appear to be affected by the operation.

The egg production of a cross between two highly productive races, H. D. Goodale (*Abs. in Anat. Rec., 31 (1925), No. 4, p. 343*).—The egg production of 200 F_1 pullets resulting from crossing two Rhode Island Red males from the Massachusetts Agricultural College with White Leghorn females, both from strains having an average winter egg production of 65 eggs, averaged 75 eggs during the winter. No increase that could be ascribed to the cross was noted for the remainder of the year.

The book of poultry, T. F. McGrew (*New York: Thomas Nelson & Sons, 1926, pp. XIV+610, pls. 58, figs. 98*).—The principles of poultry feeding, management, breeding, judging, and exhibiting are discussed, and the origin, history, and description of the various breeds of American, Asiatic, Belgian, Dutch, German, English, French, Polish, miscellaneous, game, Mediterranean, and Bantam fowls are briefly set forth.

Fowls that lay and fowls that pay, A. J. Charon (*Poules qui Pondent, Poules qui Paient. Paris: Libr. Agr. Maison Rustique* [1925], *4. ed., pp. VIII+236, figs. 72*).—This book brings out the essential principles of poultry and egg production, based mainly on a study of English and American methods.

The laying hen [trans. title] (*Min. Agr.* [*Belgium*], *Serv. Élevage Pub. 8 (1926), pp. 19, figs. 16*).—Popular directions for the care, management, and feeding of laying hens, including an account of the increased egg production which has occurred in Belgium in recent years.

Egg production in the home country, R. F. E. Hodges (*London: Blundell-Smith & Davies, 1925, pp. 67, figs.* [*34*]).—Brief popular directions are given for incubation, brooding, housing, feeding, and breeding of poultry, and the grading and marketing of eggs.

A statistical analysis of Irish egg production, prices and trade, J. Busteed (*Univ. Col., Cork, Agr. Bul. 2 (1926), pp. XI+1-48, 59-62, figs. 13*).—The author has made a statistical analysis of the egg production of the 2,666 Wyandotte, Leghorn, and Rhode Island Red pullets in the 12 egg-laying contests which have been conducted at the Munster Institute, Cork, since 1912. The usual statistical constants have been determined and discussed, as well as the seasonal distribution of production. An effort is also made to interpret some of the results from the standpoint of the genetics of egg production. One egg-laying contest of ducks has also been carried on at the institute.

The registrations qualifications for hens in Canada are set forth.

Another portion of this publication has been noted (E. S. R., 55, p. 383).

The storage of eggs, T. Moran and J. Piqué ([*Gt. Brit.*] *Dept. Sci. and Indus. Research, Food Invest. Bd. Spec. Rpt. 26 (1926), pp. VIII+80, pls. 9, figs. 19*).—The first part of this work gives a critical description of the commercial methods of storing eggs based on observations from many sources. The second portion of the work gives the results of studies of the physical and chemical changes in eggs following exposure to low temperatures and freezing. These results show that the physical condition of the egg is markedly changed by freezing. Below 0° C. the embryo of fertile eggs soon dies, and such eggs maintain their fertility longest when stored at 8° to 10°.

The secrets of artificial incubation, E. Villegas Arango (*Los Secretos de la Incubación Artificial. Madrid: Renacimiento,* [*1925*], *pp. 219, figs. 29*).—The principles and practice of artificial incubation of hens' eggs are presented, including descriptions of the developing embryo.

DAIRY FARMING—DAIRYING

The National Institute for Research in Dairying annual report, 1925 (*Natl. Inst. Research Dairying* [*Reading*] *Ann. Rpt. 1925, pp. 55, pls. 10*).—The annual report (E. S. R., 54, p. 475) for the year ended July 31, 1925, gives a general account of the institute and includes brief progress reports of the

experimental work, dealing mainly with the feeding and nutrition of dairy cattle and the physical and chemical properties and bacteriological content of milk and dairy products.

[Experiments with dairy cattle at the Florida Station], J. M. Scott (*Florida Sta. Rpt. 1925, pp. 13–15*).—The results of two feeding experiments for milk production are briefly reported.

Corn v. Napier grass for silage.—In this experiment 2 lots of 4 cows each were selected for determining the comparative feeding value of Napier grass and silage. The type of silage fed to each of the groups was alternated during four 28-day periods. The total milk produced by the cows fed grain and corn silage was 5,731.2 lbs, as compared with 5,309.3 lbs., the amount produced by the cows fed grain and Napier grass silage.

Alfalfa meal v. beet pulp.—In making this comparison 2 lots of 2 cows each were fed 10 lbs. per day on a grain mixture, supplemented in one group with 4 lbs. of alfalfa meal and in the other group with 4 lbs. of beet pulp. During the four 28-day experimental periods, in which the alfalfa meal and beet pulp groups were reversed, those receiving alfalfa meal produced 4,397.7 lbs. of milk as compared with 4,373.8 lbs., the total milk production of the cows while receiving beet pulp.

Feeding the dairy cow, H. P. Davis (*Nebr. Agr. Col. Ext. Circ. 621 (1926), pp. 29*).—The principles of feeding are discussed with special reference to the summer and winter feeding of dairy cattle.

The maintenance requirement of cattle for protein, as indicated by the fasting katabolism of dry cows, E. B. Forbes, J. A. Fries, and M. Kriss (*Jour. Dairy Sci., 9 (1926), No. 1, pp. 15–27*).—The results of studies of protein metabolism in 4 Jersey cows fasted for 3, 6, or 9 days are reported from the Pennsylvania Institute of Animal Nutrition. In these studies the feces and urine were collected as a mixture and separated by decantation and filtration. The data are tabulated showing the daily live weights, water consumption, and urine and feces excretion, including the amounts of dry matter, crude fiber, and nitrogen in the excreta, together with a summary of the average daily excretions for the different parts of the fasting periods, including the last 2 days of the fast.

The study of the results showed that the fasting did not appear to have any ill effects on the physical condition of the animals, but that the daily amounts of water consumed and urine and feces produced were very irregular. Due to this irregularity, it was difficult to determine when the actual transition from feed to fast occurred. There was also a considerable persistence of crude fiber in the feces even at the end of the 9-day fasting period.

The large drop in the excretion of total nitrogen between the first and third days of fasting and the uniformity of the average excretion of dry matter, crude fiber, and total nitrogen in the 9-day period, after omitting successively the first 2, 3, 4, 5, and 6 days' collections, indicated that fasting conditions were reached soon after the first 2 days of the fast, and that the urinary nitrogen of the last 4 days of this period may be safely considered as unaffected by the residual feed.

The average daily excretion of urinary nitrogen per 1,000 lbs. of live weight for the 2 cows during the last 4 days of this long period was 46.5 gm. by one cow and 43.6 gm. by the other. The average of these values is equivalent to 0.6 lb. of protein, the exact estimate of Armsby for the maintenance requirement of digestible crude protein per 1,000 lbs. of live weight. In maintenance trials with these cows before the fasting periods, in which nitrogen equilibrium was approximated with small gains in energy, considerably larger

amounts of protein were supplied. It is assumed that the surplus was used for the production of energy.

A study of calcium and phosphorus balances with dairy cattle, R. C. Miller (*Jour. Dairy Sci.*, *9* (*1926*), *No. 1*, *pp. 78–92*).—Calcium and phosphorus balances of 3 mature Holstein cows were determined at the New York Cornell Experiment Station in 4 experiments primarily conducted for the purpose of studying the nitrogen balances with dairy cattle. Each experiment was divided into 3 periods, a transition period of 7 to 10 days when the cows received the feeds characteristic of the trial, a preliminary period of 4 to 7 days, during which the actual experimental ration was given, and a collection period of 12 to 14 days, which was the experiment proper. The rations included clover hay in the first and fourth experiments, and timothy hay in the second and third experiments. Corn silage was fed throughout, together with a grain mixture composed of corn meal, ground oats, wheat bran, and oil meal in the first, second, and third experiments. The wheat bran and oil meal were omitted in the last test. The experimental animals were allowed some exposure to sunlight as the work progressed.

The average daily balances of calcium and phosphorus showed that all were negative except in one case for each mineral in the first experiment and in one case for phosphorus in the second experiment. Smaller negative calcium balances were generally obtained when clover was fed instead of timothy. It is pointed out that in this and other work an improved assimilation of calcium has frequently accompanied an improvement in the quality of the protein supplied.

The phosphorus balances were improved when larger amounts of this element were supplied in the grain. A certain amount of independence of calcium and phosphorus assimilation was evident. The analyses of the milk showed that the calcium and phosphorus contents were relatively constant, but the milk from the individual cows was slightly higher in both calcium and phosphorus when the cows were receiving timothy hay, due probably to larger amounts of phosphorus in the grain fed in combination with this type of hay.

The rôle of the antiscorbutic vitamin in the nutrition of calves, L. M. Thurston, C. H. Eckles, and L. S. Palmer (*Jour. Dairy Sci.*, *9* (*1926*), *No. 1*, *pp. 37–49*, *figs. 9*).—The results of two experiments to study the vitamin C requirement of dairy calves are reported from the Minnesota Experiment Station. Two calves were fed for one year in each experiment on rations deficient in vitamin C as determined in tests with guinea pigs, while two other calves were given similar rations except that vitamin C was suppled in the form of lemon or tomato juice.

The feeds used in the first experiment included autoclaved alfalfa hay, oat straw, milk (heated to 180° F., with oxygen bubbled through it for 1 hour), and a grain mixture to which butterfat was added. Stiffness developed in all of the calves in this experiment, which condition was corrected by replacing the butterfat with cod-liver oil and calcium carbonate. Some hemorrhagic areas were found on autopsy in the vicinity of the joints in all of the calves, and lesions which indicated rickets were observed.

Calves 2 weeks old were used in the second experiment in contrast with calves approximately 100 days of age in the first experiment. The rations were similar, except that the roughage consisted of timothy and wild hay and cod-liver oil replaced the butterfat. The results of both experiments indicated that quite favorable growth was obtained, especially in the latter trial, and that the stiffness observed in the first experiment and the hemorrhagic areas and swellings found on autopsy were due to a deficiency either of minerals or of the

antirachitic vitamin. It is concluded, therefore, that the bovine either synthesizes its own vitamin C or does not require it.

Dairy calf care and management, H. P. Davis and R. F. Morgan (*Nebr. Agr. Col. Ext. Circ. 622* (*1926*), *pp. 31, figs. 7*).—Directions for the care, management, and feeding of dairy calves, including a discussion of diseases.

The influence of the period of heat on milk production, A. C. McCandlish (*Jour. Dairy Sci., 9* (*1926*), *No. 1, pp. 65–67*).—The author has determined the effect of the heat period on the milk production of cows from 868 breeding records of the Iowa Experiment Station herd by comparing the milk production of the day on which the cows were bred with the average daily milk production for the 3 preceding and the 3 following days. The average production for all breeds for the 3 days before breeding was, respectively, 21.8, 22.0, and 21.8 lbs.; for the day of breeding, 21.2; and for the 3 days following breeding 21.3, 21.7, and 21.8 lbs. The daily production before and after breeding was nearly always higher than the production on the day of breeding, even for the different breeds. The highest average production occurred at 2 days before breeding. Individual cows were found to show considerable variation with respect to the comparative rate of production during oestrum.

Transmission of butter-fat percentage by Holstein-Friesian sires, T. A. Baker (*Delaware Sta. Bul. 145* (*1926*), *pp. 3–15*).—For this study the average butterfat percentages of the milk of the daughters of 262 Holstein-Friesian sires having 10 or more daughters with records of 305 days or more were calculated. Three-generation pedigrees were then compiled for the 40 bulls whose daughters averaged the highest in butterfat percentage and for the 40 having the lowest butterfat percentages. The number of times that the more frequently recurring sires have appeared in each generation of each group is also tabulated, and 9 genealogical charts are presented indicating the bulls in each generation which transmit high and low butterfat percentages. A survey of the charts indicates that certain blood lines carry factors for high or low butterfat percentage, but the difficulty of raising a herd to a high average is pointed out.

Physico-chemical factors influencing cream rising.—I, Viscosity, L. S. Palmer and E. O. Anderson (*Jour. Dairy Sci., 9* (*1926*), *No. 1, pp. 1–14, fig. 1*).—*This is a more extensive report of investigations previously noted* (E. S. R., 50, p. 179).

Determinations made on composite 24-hour samples of milk from Jersey, Guernsey, Ayrshire, and Holstein cows did not show any relation between the H-ion concentration and the viscosity of the milk, but there was a relation between the fat content and solids-not-fat and viscosity. Two experiments in which Holstein skim milk was standardized to 3.5 per cent of butterfat by adding Jersey-Guernsey cream and Jersey-Guernsey skim milk was standardized to 3.5 per cent of fat with Holstein cream showed that the size of the fat globules did not affect the creaming qualities, but that there was a relation between the solids-not-fat and the viscosity. The latter was also related to the creaming quality in raw milk. This relationship disappeared in milk creamed at 9 to 12° C.

The reduction in creaming powers resulting from pasteurization was found in four experiments to be partially due to the accompanying decrease in viscosity, but viscosity was concluded to be only a minor factor in determining differences in the creaming quality of pasteurized milk.

Analyses of the skim milk and cream for butterfat before and after pasteurization showed that with a reduction in the cream volume there was a higher percentage of fat in the skim milk and also a higher percentage of fat in the cream. Thus the loss in creaming quality was apparently due to less ex-

haustive creaming of the milk and to a closer packing of the fat globules in the cream layer. It is concluded that the plasma colloids are more important in determining cream volume than the fat globules.

Factors influencing the viscosity of cream and ice cream, F. F. SHERWOOD and H. L. SMALLFIELD (*Jour. Dairy Sci., 9 (1926), No. 1, pp. 68–77*).—In experiments at the Iowa Experiment Station the effect of pasteurization, homogenization, and aging on the viscosity and the formation of fat globules in cream and ice cream was studied. In 5 of 6 trials pasteurized cream had a higher viscosity after holding for 24 hours than when fresh. The appearance of the fat globules in the pasteurized samples showed no particular changes during aging. In homogenized cream the viscosity increased during aging in some samples but decreased in others. A direct relation between the viscosity and the clumping of the fat globules was observed. When the viscosity increased the size of the clumps of fat globules was greater than when the viscosity decreased.

In further experiments the effect of agitation on viscosity of cream and ice cream was compared by testing the cream, the ice cream mix, and the ice cream after 2, 4, 6, 8, and 10 minutes of agitation during the freezing process. The results showed that the viscosity and the size of the clumps of fat globules decreased as the amount of agitation increased. The stirring together of the ingredients of the mix caused a considerable decrease in the viscosity of the product.

Finding a key to viscosity control, G. D. TURNBOW and F. W. MILNER (*Ice Cream Trade Jour., 22 (1926), No. 4, pp. 64a–64d*).—Studies of the effect of various ingredients on the viscosity of the ice cream mix have been conducted at the California Experiment Station by determining the viscosity of the mix before and after adding certain of the ingredients. The results showed that gelatin was by far the most important ingredient for increasing viscosity. Viscosity was also increased during aging, and the addition of sugar increased it slightly. Fat did not appear to influence viscosity to any great extent. Severe agitation during pasteurization and freezing tended to reduce viscosity materially.

Comparative studies of gelatin showed that quality can not be judged by the color of a water solution, but must actually be tested after neutralizing for differences in the pH concentration.

[Clarification of milk] (*Idaho Sta. Bul. 142 (1926), p. 16*).—Temperature did not appear to affect the amount of visible dirt removed, the flavor and keeping quality of the milk, or the cream line, though milk clarified at low temperatures gave smaller increases in bacterial counts. Cheese made from clarified milk had an average score of 1.8 per cent higher than cheese made from unclarified milk.

Studies on the sterilization of churns, D. B. SHUTT (*Michigan Sta. Rpt. 1925, pp. 182–191*).—Experimental studies of the possibility of sterilizing contaminated churns with hot water, a saturated solution of lime water, solutions of sulfuric acid, Sterilac, Montanin, and hyperactive iodine indicated that none of the treatments in the cold state would sterilize, though they generally considerably reduced the numbers of bacteria and molds present.

Some factors affecting the growth of certain strains of P. roqueforti.—I, Blue mold, N. S. GOLDING (*Jour. Dairy Sci., 9 (1926), No. 1, pp. 28–36, figs. 2*).—Studies of the effect of citric and acetic acids on the growth of strains of *Penicillium roqueforti* isolated from Roquefort and Wensleydale cheese are reported from the University of British Columbia. In making these studies the cultures of the molds were inoculated into sweet skim milk and on plates of standard agar media containing 0.272 or 0.1423 per cent of citric acid, or 0.181

or 0.048 per cent of acetic acid. The amount of growth in the milk media was determined by the amount of undigested casein present after 10 days' incubation, while the diameter of a single colony on the plates after 3 days was used as the index of growth. The incubation temperature ranged from 20 to 22.5° C.

The results showed that the two cultures from Roquefort origin had a greater power to digest casein than the two cultures which originated in Wensleydale cheese. Acetic acid tended to reduce the digestion of casein, particularly in weak concentrations, while citric acid tended to increase the digestion of casein by *P. roqueforti.* Certain individual differences in the rate and characteristics of growth are pointed out. The main practical conclusion from this work is that the type of starter used might have a distinct effect on the mold growth in blue veined cheese.

VETERINARY MEDICINE

International agreement for the creation at Paris of an International Office for Dealing with Contagious Diseases of Animals, Paris, January 25, 1924 (*[Gt. Brit. Foreign Off.] Treaty Ser. No. 11 (1926), pp. 19*).—The text of the agreement setting up an International Office for Dealing with Contagious Diseases of Animals, at Paris, is presented in French and English.

New and nonofficial remedies, 1926 (*Chicago: Amer. Med. Assoc., 1926, pp. [2]+459+XLIII; Sup., pp. 21*).—This contains descriptions of the articles which stood accepted by the Council on Pharmacy and Chemistry of the American Medical Association on January 1, 1926, and a supplement which describes the articles which were accepted from January 1 to August 1, 1926.

On the toxic action of carbon disulfide, IV [trans. title], K. Muto (*Jour. Japan. Soc. Vet. Sci., 4 (1925), No. 4, pp. 339–348, figs. 2*).—This fourth contribution on the subject (E. S. R., 55, p. 473) deals with the recovering action of cocaine and atropine in cases of intoxication by carbon disulfide, pathological changes in the lungs of a rabbit succumbing after the inhalation of carbon disulfide gas, and pathological changes in the stomach and intestines after the internal use of carbon disulfide.

"Milk sick," or white snakeroot poisoning, W. E. Walsh (*Jour. Amer. Med. Assoc., 87 (1926), No. 8, pp. 555, 556*).—This is a brief general discussion in which several cases are reported upon. The author records having observed 44 cases of milk sickness during a period of 30 years and to have known indirectly of about 60 others.

The localization in animals of bacteria isolated from foci of infection, A. C. Nickel (*Jour. Amer. Med. Assoc., 87 (1926), No. 14, pp. 1117–1122*).—The author finds that microorganisms, usually streptococci, freshly isolated from foci of infection, tend to produce lesions in animals corresponding to the lesions in the patient from whom they were isolated. Any one or several of the foci studied (teeth, tonsils, prostate, or cervix) may harbor the causative organism in a given case.

On the relation between the development of the hemolytic streptococci of the horse and the H-ion concentration of the medium [trans. title], S. Umeno (*Jour. Japan. Soc. Vet. Sci., 4 (1925), No. 2, pp. 113–130*).—This is a report of studies conducted in the veterinary department of the Kitasato Institute for Infectious Diseases, Tokyo.

The epizootic of foot and mouth disease in California, C. Keane (*Calif. Dept. Agr. Spec. Pub. 65 (1926), pp. 54, pls. 2, figs. 7*).—This is a report dealing in detail with the outbreak of foot-and-mouth disease first discovered in California on February 17, 1924, and with control and eradication work conducted up to the removal of the last quarantine on June 10, 1926.

The foot and mouth disease epizootic, G. H. HECKE (*Calif. Dept. Agr., Mo. Bul., 14 (1925), No. 7–12, pp. 134–145, figs. 3*).—This is an account of the outbreak and control and eradication work conducted in California, a detailed report of which is noted above.

A histological study of the sweat glands of mammals [trans. title], K. MUTO (*Jour. Japan. Soc. Vet. Sci., 4 (1925), No. 1, pp. 1–7, pls. 2*).—This is a contribution from the Army Veterinary School, Tokyo.

Further studies in the diseases of the reproductive organs of cattle, E. T. HALLMAN (*Cornell Vet., 14 (1924), No. 3, pp. 254–274, pls. 12*).—In this contribution from the Michigan Experiment Station (E. S. R., 54, p. 676), the author records observations made in a histopathological and bacteriological examination of the reproductive organs of 15 pregnant cattle varying in duration of pregnancy from 59 days to 8 months and of 8 postparturient cows varying from 6 hours to 12 days after calving or abortion. The cases were obtained from 3 herds in which abortion disease has existed for the past 8 or 10 years. In some of the cases pathological processes attributed to infection were observed, and in others it was impossible to demonstrate the presence of microorganisms by cultural and animal inoculation methods. In the first part (pp. 255–262) the author deals with evolution and involution of the bovine uterus, and in the second part (pp. 262–272) with the pathology of *Bacterium abortus* infection in the bovine uterus.

Report of the section of animal pathology, E. T. HALLMAN (*Michigan Sta. Rpt. 1925, pp. 179, 180*).—The author reports that the work during the past year was in continuation of the studies of the diseases of the reproductive organs of cattle as noted above. The results indicate that the process by which the fetal placenta becomes attached to the maternal placenta explains the frequency of uterine infections during pregnancy. They also indicate that infectious abortion disease is primarily a disease of the maternal and fetal placenta, and that more extensive invasions of the uterus, fetal membranes, and fetus are secondary. A brief report by L. B. Sholl on a study of the udder in abortion disease is included. The findings indicate that *Bacterium abortus* may establish itself in the mammary gland and produce lesions. The author considers that these lesions favor the invasions of the udder by other pathogenic organisms, and thus explains the concinsion of many clinicians that mastitis is more prevalent and troublesome in abortion-affected herds than in herds free from the disease.

A study of the presence of Bact. abortus in the milk of cows which react to the agglutination test, C. P. FITCH and R. E. LUBBEHUSEN (*Cornell Vet., 14 (1924), No. 3, pp. 299–302*).—This is a contribution from the Minnesota Experiment Station, in which the authors report that *Bacterium abortus* was found present at some time in the milk of 29.1 per cent of cows the blood of which had reacted positively to the agglutination test. The agglutination titer of the blood of all cows examined was at least as high as 1–100 at the time positive milk samples were taken. It was found that the agglutination titer of the blood and milk may be quite different in the same individual, and that milk can not be considered as a substitute for blood for a satisfactory test.

The agglutination test as an aid in handling Bang abortion disease, R. R. BIRCH and H. L. GILMAN (*Abs. in Cornell Vet., 16 (1926), No. 2, pp. 127–132*).—This is a summarized account of Bang abortion disease, the agglutination test, and its practical application.

Bovine tuberculosis and its control in Japan, N. NITTA (*Jour. Japan. Soc. Vet. Sci., 4 (1925), No. 4, pp. 367–374*).—The author reports upon the occurrence of this disease among cattle in Japan and control work that has been undertaken. Of 65,017 dairy cattle slaughtered during the years 1916–1923, 10.2

per cent were found to be tuberculous. Of 118,093 head of cattle examined during 1923, 0.46 per cent were found diseased and 0.36 per cent suspected.

Sheep scab: Psoroptic scabies of the sheep, J. WALKER (*Kenya Colony Dept. Agr. Bul. 5 (1924), pp. 18*).—This is a summary of recent experiments and observations carried out in South Africa, in which 18 sheep dips were tested. The general results showed successful cure of scab in all except one test.

Bacteriological investigations of equine infectious abortion [trans. title], L. PANISSET and J. VERGE (*Ann. Inst. Pasteur, 40 (1926), No. 6, pp. 524–540*).—A report of investigations of equine abortion and of *Bacillus abortus equi* conducted during 1924 and 1925 in France, where the last investigation of this disease in the mare was reported by Dassonville and Rivière in 1913 (E. S. R., 29, p. 281). The close relationship of *B. abortus equi* and *B. aertrycke* is pointed out.

It was found that in small laboratory animals active immunization confers a resistance that protects against an otherwise fatal dose. This immunization was easily obtained from cultures killed by heat or by means of an antiseptic. Immunization studies of the horse are under way.

Early cirrhosis of the liver produced in dogs by carbon tetrachloride, P. D. LAMSON and R. WING (*Jour. Pharmacol. and Expt. Ther., 29 (1926), No. 1, pp. 191–202, figs. 8*).—The authors found that carbon tetrachloride, alone in doses of from 3 to 25 cc. or with large amounts of alcohol (25 cc. of 50 per cent alcohol) in doses of 3 cc. (the therapeutic dose), may be given to dogs at intervals of approximately 2 days over a period of at least 15 weeks without loss of weight or disturbance in the apparent health of the animal. The continued administration of carbon tetrachloride alone in small or large doses, or together with alcohol, produces lesions, all of which are of the same type and of approximately the same severity. The lesions found are those of early cirrhosis of the liver, and it is believed from their appearance that a more prolonged treatment with this drug will produce a true Laennec cirrhosis with circulatory obstruction.

The pathology of whipworm infestation in dogs, S. L. HUNG (*North Amer. Vet., 7 (1926), No. 8, pp. 39–45, figs. 3*).—This contribution from the Zoological Division of the U. S. D. A. Bureau of Animal Industry includes a list of 46 references to the literature.

Notes upon a certain anaerobe isolated from whale muscle, I, [trans. title], Y. KAWAMURA, H. NAGAO, and Y. FUKUYAMA (*Jour. Japan. Soc. Vet. Sci., 4 (1925), No. 1, pp. 49–68, pl. 1*).—Attention is called to the investigations that have been conducted on acute gangrenous infection of whales, Nielsen in 1888 having considered the causative organism to be similar to that of blackleg, Christiansen in 1919 having placed it in the same group as the Ghon-Sachs bacillus, and Heller in 1920 (E. S. R., 45, p. 480) having referred the organism to the *Vibrion septique* group.

In recent studies by the authors the organism was isolated from salted muscle from a whale which apparently had succumbed to an emphysematous inflammation of muscle near the tail in a district in Japan in which many cattle and horses are reported to have died successively with similar symptoms of blackleg. The characteristics of the organism isolated from the whale meat are described. It was found to be highly pathogenic for guinea pigs and rabbits, producing a gelatinous infiltration in subcutaneous tissues with little or no gas production and hemorrhagic inflammation of lymphatic glands. It was found to be predominantly saccharolytic, with slight proteolytic properties, as indicated by the liquefaction of gelatine, but not identical with *Bacillus welchii* or *B. botulinus*.

Causes of death in poultry flocks, S. ERIKSEN (*Jour. Amer. Vet. Med. Assoc., 69 (1926), No. 5, pp. 589–595*).—Data based upon studies made during the

course of egg-laying contests at the Missouri Poultry Experiment Station are presented. Records of 2,775 birds show the average mortality to have been 13.3 per cent for their first productive year.

[Report on poultry disease investigations at the Michigan Station] (*Michigan Sta. Rpt. 1925, pp. 195–199, 207, 208*).—In studies of bacillary white diarrhea, reported by H. J. Stafseth, it was found that so-called cloudy reactions were due to excess protein in the blood of hens or pullets, more especially of those that were laying heavily. This protein is easily thrown out of its colloidal solution and often forms a heavy flocculent mass in the test tube. This flocculent material, which has been referred to as a fatty substance, interferes materially with the practical applicability of the agglutination test. Molting hens and pullets that have not come into production do not give a large enough number of cloudy reactions to cause any difficulty, and male birds have never been found to give cloudy reactions. During the months of October, November, and December fewer cloudy reactions are encountered than during the rest of the year, especially with adult birds. Since it appears that pullets can not be tested with a marked degree of success before they have reached laying age, at which stage they will often give cloudy reactions, it is recommended that adult birds be used for breeding stock, and that they be tested during the months mentioned above if losses are encountered from bacillary white diarrhea. The year's exerience confirms the author's opinion that at least two dilutions of serum-antigen mixture must be used, namely, 1 to 40 and 1 to 100, the first of which should pick out weak reactors and the second pro-agglutinating samples. It is pointed out that the turbidity of the antigen must not be greater than that of tube No. 1 of McFarland's nephelometer, and the tests should be read after 48 hours' incubation. Of a total of 20,470 samples of blood tested, 2,728 gave positive reactions, 2,016 partial reactions, 2,229 cloudy reactions, 967 were unfit, and 12,530 were negative.

In studies by A. Kotlan of 6-months and 1-year-old birds, *Davainea proglottina* was found in enormous numbers in a flock of Rhode Island Reds in all but 1 of 13 or 14 cases of incoordination of movement, or leg weakness. Bacteriological examination, cage exposures, and injections with tissue extracts failed to show the presence of an infectious disease. Attempts were made to demonstrate a hemotoxin in the *D. proglottina*, but the results were too indefinite to be valuable. Reference is made also to work by Kotlan on goiter and sarcomatosis in poultry, and by Kotlan and Chandler on a newly recognized fluke disease due to a *Prosthogonimus* sp. from chickens and mallard ducks in the United States, an account of which has been noted (E. S. R., 55, p. 778).

It is reported by W. L. Mallmann that bacteriophage active against *Bacterium pullorum* was obtained from chicken feces by Pearson. Seventy-five chicks hatched from eggs obtained from poultry that showed a positive agglutination test for bacillary white diarrhea were injected as soon as they were taken from the incubator, and 25 chicks from such eggs were kept as controls. At the end of 2 weeks 50 per cent of the controls and only 25 per cent of the treated chicks had died. Since the bacteriophage used had not been invigorated and hence possessed rather low lyptic powers, the results were very satisfactory, and the author plans to repeat the experiment with a highly lyptic bacteriophage.

A medium that would separate and identify *B. pullorum*, *B. sanguinarium*, *B. avisepticum*, *Bacillus coli*, and *B. paratyphosus* A was devised by E. Snyder.

Investigations on bacillary white diarrhea infection of fowls, W. A. Hooker (*U. S. Dept. Agr., Off. Expt. Stas., Rpt. Agr. Expt. Stas., 1925, pp. 95–130*).—A compilation of the literature on the subject issued up to the close of 1925 in connection with a list of 175 references. The data are arranged in a systematic and chronological form.

Eradication of bacillary white diarrhea, F. R. Beaudette (*New Jersey Stas. Hints to Poultrymen, 14 (1926), No. 11, pp. 4*).—This practical account is based upon the work in New Jersey in 1924–25, the details of which are presented in Bulletin 425, previously noted (E. S. R., 55, p. 74), and that in 1925–26. It is pointed out that the program for eradication of this disease has been in operation in the State for two years, the number of birds tested having increased from 28,103 in 1924–25 to 52,611 in 1925–26, with indications that the number of tests in 1926–27 will be about 100,000. Of the 52,611 birds tested, 7.85 per cent were found infected, including 5.46 per cent of the certified and 15.19 per cent of the noncertified. Records available for 13 flocks tested two years show that 5.65 per cent of the 3,273 birds therein were infected in 1924–25 and but 2.76 per cent of the 4,558 birds in these flocks were infected in 1925–26.

It has been found in New Jersey that the percentage of infection is high in heavy breeds and low in light breeds, only 1.82 per cent of 29,875 White Leghorns tested in 1925–26 having been infected as compared with 21.23 per cent of 4,699 Jersey Black Giants. It is pointed out that more than one blood test is necessary to eradicate the disease because (1) the test is made for an antibody in the blood serum and not from the infecting organism itself, and, since the antibody does not develop immediately when the infection is contracted, a recently infected bird might not be detected by the test, and (2) poultrymen do not always disinfect the premises properly following the test, and hence some of the healthy birds contract the infection and become carriers. Thus the test must be applied annually until two consecutive negative reports are received.

AGRICULTURAL ENGINEERING

Practical water-power engineering, W. T. Taylor (*New York: D. Van Nostrand Co., 1925, pp. VII+270, pls. 4, figs. 28*).—A treatment of technical and commercial factors in water-power engineering is presented in this book, special reference being made to field work involving a study of stream flow, pondage capacity, developed waterways, and power transmission lines. Chapters are included on hydraulics and water-power development; catchment, rainfall, and run-off; selection of water-power sites; storage and pondage; stream flow; the gravity conduit; pressure pipe lines; hydraulic losses; automatically controlled small water-power plants; reporting on a water-power project; water legislation; high-voltage power transmission; power transmission line calculations; and overhead electric-power transmission economics.

Water resources of Tennessee, W. R. King (*Tenn. Dept. Ed., Div. Geol. Bul. 34 (1925), pp. XVI+909, pls. 33, figs. 6*).—This report, prepared in cooperation with the U. S. Geological Survey and the U. S. Engineer Department, is a compilation of existing data pertaining to the surface waters of Tennessee and their utilization.

Are current ideas basing duty of water experiments sound? F. J. Veihmeyer (*Agr. Engin., 7 (1926), No. 3, p. 91, fig. 1*).—Studies conducted at the California Experiment Station are briefly reported which indicated that young prune trees grown on clay loam soils in tanks used water at the same rate per unit leaf area when the atmospheric evaporating power was the same and when the soil moisture content was reduced almost to the wilting coefficient as it was when the soil was filled to its maximum field or capillary capacity. It is concluded that the use of water by these trees was not influenced by differences in the amounts of water available for growth, and that optimum moisture conditions for growth cover a range of soil moisture from the maximum field or capillary capacity to about the wilting coefficient.

Seasonal variation in salinity of Nile water at Rodah (Giza), with special reference to alkaline carbonates, R. ALADJEM (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 69 (1926), pp. 11, pl. 1*).—Studies are reported which showed that the alkali portion of the total dissolved solids of Nile water is very small. Nile water contains more sodium and potassium during the months of low stage and more calcium and magnesium during the period of high Nile. This is taken to indicate that either some calcium and magnesium of the bicarbonates is thrown out during low Nile or that some water from the subsoil laden with alkaline bicarbonates drains into the river. It is concluded, however, that no damage may result from land irrigated with such water.

Land clearing in Alabama bottom lands, R. GODWIN (*Alabama Sta. Circ. 50 (1926), pp. 8, fig. 1*).—The results of experiments with explosives are reported which showed that the cost per stump was nearly doubled for each increase of 3 in. in diameter.

When the soil was loose, friable, and soft, and had a low free water content, the blast was forced into the earth by the heavy rooted hardwood stump above. An extra large charge heaved the soil through the roots and left the stump intact, indicating that the force of the blast compressed the soil on the bottom and sides of the shot hole. The loose soil sifted between the roots, leaving the stump in place with a large hole under it. With soil having a high free water content, the blast was found to meet positive resistance on the bottom and sides of the shot hole, due to the free water rendering it less compressible. The line of expansion of the blast was upward after a relatively small downward and lateral expansion. The wet soil held together and acted as a shoulder for the force of the blast to lift against.

In dry land 20 per cent ammonia dynamite with a speed of 9,600 ft. per second was too slow, since it blew the dirt from under the stump and left it practically in place. Sixty per cent dynamite with a speed of 16,000 ft. per second was more satisfactory, but was too fast, since it shattered the stump without removing it. The most satisfactory explosives were the 30 and 40 per cent dynamites having speeds of 12,000 and 14,000 ft. per second, respectively. All of these explosives were satisfactory in wet soil. There was little or no difference in the performance of high counts of 30 and 40 per cent dynamites.

Experiments on the relation of stump diameter and size of charge showed that the load in pounds of high count dynamite necessary for the removal of green hardwood stumps in wet soil was equal to the square of the diameter of the stump in feet 14 in. from the ground plus 0.5.

Terracing in Mississippi, J. T. COPELAND (*Miss. Agr. Col. Ext. Bul. 34 (1926), pp. [19], figs. [14]*).—Practical information on terracing under Mississippi conditions for the prevention of soil erosion is presented.

Experimental impact studies on highway bridges, A. H. FULLER and R. A. CAUGHEY (*Iowa Engin. Expt. Sta. Bul. 75 (1925), pp. 61, figs. 45*).—This is a progress report of work on the subject previously noted (E. S. R., 48, p. 782; 52, p. 184), which is being done in cooperation with the U. S. D. A. Bureau of Public Roads and the Iowa State Highway Commission.

The stringer spacing in concrete floor bridges did not vary sufficiently to permit the drawing of general conclusions. The observed stresses in all instances were far below the computed ones. For a truck loaded to give approximately the proportions of front and rear axle loads now generally specified in highway bridge specifications, and traveling at a rate of speed of 12 miles per hour, the impact increment of stress in the stringers and the floor beams under smooth concrete floors, stressed well toward allowable

limits, was below 15 per cent. When the wheels of the truck ran over 1 by 2-in. obstructions, the percentage was about 50, and for 2- by 4-in. obstructions about 100. The impact in the floor system of timber floored spans varied greatly with the conditions of the individual floor, and a general statement could not be made.

The relationship between speed and dynamic stress and also between speed and dynamic force was so nearly a straight line relationship that this interpretation was generally made.

Alumina cements and sulphate water, D. G. MILLER (*Concrete* [*Chicago*], *Cement Mill Ed., 28* (*1926*), *No. 4, pp. 29–31*).—The results of experiments conducted by the Minensota Experiment Station, the Minnesota Department of Drainage and Waters, and the U. S. Department of Agriculture are reported (E. S. R., 54, p 180).

Laboratory tests indicated that high alumina cement concrete reaches its ultimate strength at about 7 days, and that thereafter the strength remains constant. All high alumina cement concrete and mortar cylinders, regardless of curing conditions, showed an average strength ratio considerably above 100 per cent after 1 year's exposure to the sulfate waters of Medicine Lake, S. Dak., as compared with cylinders from the same lots stored in tap water in the laboratory.

One series of the French high alumina electric cement stored in the laboratory in a 1 per cent solution of sodium sulfate had a strength ratio at 1 year of 101 per cent as compared with cylinders from the same group stored in tap water in the laboratory. Tests at 2 years were less favorable, as the strength was but 75 per cent, indicating a necessity for later tests before drawing conclusions. With two exceptions none of the high alumina cement cylinders showed any appreciable surface action. These results are taken to indicate the necessity for a hardening period for all high alumina cement concrete exposed to the action of sulfate waters.

All the tests indicated that high alumina cement is perhaps somewhat more resistant to the action of sulfate waters than is most standard Portland cement. However, it is not 100 per cent resistant. It was found not feasible to mix alumina cement and standard Portland cement except within very narrow limits.

Cement-lime mortars, H. V. JOHNSON (*U. S. Dept. Com., Bur. Standards Technol. Paper 308* (*1926*), *pp. 241–274, figs. 14*).—Tests upon cement-lime mortars are reported in which the percentages of cement, lime, and sand were varied considerably. It was found that the addition of lime to cement mortars increased the water requirement for the same consistency very nearly in proportion to the percentage of lime added. Shrinkage was increased by the addition of extra water. This is taken to indicate that where low shrinkage is of prime importance, lime should be limited in cement mortars. The addition of lime in small amounts increased the density of lean cement mortars. The principal advantages resulting from the use of lime in cement mortars were found to be an increase in workability and a reduction in cost.

Rammed earth walls for buildings, M. C. BETTS and T. A. H. MILLER (*U. S. Dept. Agr., Farmers' Bul. 1500* (*1926*), *pp. II+26, figs. 22*).—Practical information on the use of rammed earth for building construction is presented, the greater part of which has been abstracted from accounts of experimental work in England.

Rural electric development in Alabama, E. C. EASTER (*C. R. E. A. Bul.* [*Chicago*], *2* (*1926*), *No. 5, pp. 12, figs. 4*).—A summary of results of two years' field investigations conducted by the Alabama Experiment Station on the use

of electricity on Alabama farms is presented. The greater part of the data so far deals with the amount of electricity utilized for different purposes.

Rural electricity (*New Hampshire Sta. Bul. 221 (1926), pp. 36–38*).—The work at the station on the use of electricity in agriculture is briefly outlined.

The results obtained so far indicate that the dairy farm offers the greatest possibilities for electrification, with the poultry farm a close second. The general farm apparently has a chance to displace one or both of these, but the fruit farm, if operated solely as such and carrying no stock, appears to offer the least possibilities for building up an electrical load.

Electricity in rural districts served by the Hydroelectric Power Commission of the Province of Ontario, Canada, E. A. Stewart (*University Farm, St. Paul: Author, 1926, pp. 35, figs. 2*).—The results of a survey of the use of electricity in the agricultural districts of the Province of Ontario under the method of operation with governmental assistance are presented.

It was found that the actual percentage of Ontario farms served by the Hydroelectric Power Commission or any of its subsidiary divisions is 2.52 per cent, which is a little less than the average in the 48 States of this country. The method of operation with governmental assistance in financing rural electrification apparently has not made it possible to supply any large part of the farmers of Ontario or to secure cheap electricity on the farm. The conclusion is drawn that electricity at low energy rates will not alone solve the problems of rural electrification, but that electrical equipment at a low price is also necessary.

A report on the use of windmills for the generation of electricity (*Oxford Univ., Inst. Agr. Engin. Bul. 1 (1926), pp. 63, pls. 6, figs. 11*).—Tests of seven windmill generating plants are reported.

The results indicate that the disk area basis of calculation of efficiency gives the multibladed wheels the highest position, whereas on the blade area basis the highest efficiencies are shown by 4- and 5-bladed types. A 4-bladed wheel was found to be the most efficient even at low wind velocities. The next most efficient type was one with semistream-lined metal blades. This was closely followed, and surpassed at low wind velocities, by an improved wheel with the outer trailing edge of each blade rounded off. This resulted in an increased wheel speed, lower cutting-in speeds, and a greatly improved blade area efficiency.

The cost of electricity generated by windmills either for small lighting or for small power purposes is deemed reasonable and such as to justify a wider use in districts remote from central station facilities.

Small power plant for farm and workshop (*Rural Indus. Bur. [London] Leaflet 26 [1925], pp. 40, figs. 7*).—Small power plants for the farm and workshop using water, wind, steam, and internal-combustion engine power are described. Data on power transmission are included.

Crank case dilution in kerosene burning tractors, L. G. Heimpel (*Sci. Agr., 6 (1926), No. 8, pp. 275–279, figs. 2*).—Studies conducted at Macdonald College, Quebec, are reported which seemed to indicate very clearly that a close relationship exists between the mechanical condition of the engine and the rate of dilution. An engine which had a very poor compression, for instance, showed a heavy fuel consumption accompanied by heavy dilution. An engine of the same make, but in good condition, showed a much lower percentage of dilution. In all of the engines tested, however, the dilution resulting from the burning of kerosene was considered to be much heavier than any oil can bear and still maintain its lubricating value. It is considered safe to assume, therefore, that about half of the time the average kerosene-burning

tractor is at work it is suffering from lack of proper lubrication. The use of kerosene in any but fresh-oil types of engines is advised against.

Lubrication of plain bearings, D. P. BARNARD, IV (*Jour. Soc. Automotive Engin., 18 (1926), No. 5, pp. 483–485, figs. 2*).—Studies are briefly reported of the behavior of oil after it has reached a bearing. A visual study was made by means of a glass bearing, and the results were reproduced by a film, the action of the lubricant being made visible by introducing into the oil a small quantity of dyed glycerine solution of about the same viscosity as the oil.

In one case the operating conditions were such that a relatively thick supporting film was formed and the oil followed closely the direction of journal rotation. In another case, however, the conditions were altered to allow the film to thin out to a marked degree. In this case the oil was forced more rapidly toward the ends of the bearing. This study also showed, in a striking manner, the effect of moving the oil hole to the loaded side of the bearing in actually allowing the bearing to suck in air at the ends and to displace the oil backward along the feed tube. With such an arrangement it would be necessary to provide a very high feed pressure to insure the proper flow of oil.

Station work on the mechanics of tillage, R. W. TRULLINGER (*U. S. Dept. Agr., Off. Expt. Stas., Rpt. Agr. Expt. Stas, 1925, pp. 131–138*).—A critical summary is given of the progress of work on soil dynamics as it affects soil tillage and the development of tillage machines.

The conclusion is drawn that the more active of the engineering properties of soils from the standpoint of tillage are in turn governed largely by the moisture content and the colloidal phenomena of soils. Fertilizer and cropping treatments also seem to exert a marked influence on these engineering properties when properly applied, and may therefore facilitate the development of tillage machines capable of producing desired tillage results.

A consideration of these soil characteristics in connection with certain of the fundamental laws of physics seems especially to throw light on the design of tillage implements capable of producing desired tillage results with a minimum utilization of power.

Effects of soil treatments upon the draft of plows, F. L. DULEY and M. M. JONES (*Soil Sci. 21, (1926), No. 4, pp. 277–288, figs. 4*).—Dynamometer tests conducted at the Missouri Experiment Station on 19 plats of silt loam soil that had received different rotation and manurial treatments during the past 36 years are reported.

Heavy manuring had little effect upon the draft of plows, but in general seemed to have a tendency to increase it. The unmanured soils usually worked down into a more friable seed bed condition than did the manured soils. Chemical fertilizers, even in heavy applications, did not increase the plow draft, and seemed to give slightly lower results than were obtained on manured soils. The draft tended to increase as the soil moisture decreased where the measurements were made under fairly satisfactory plowing conditions. Manured soil contained more moisture than unmanured soil.

A study of factors involved in ensilage cutter design, F. W. DUFFEE (*Agr. Engin., 7 (1926), No. 3, pp. 84–87, 98, figs. 6*).—The progress results of studies at the Wisconsin Experiment Station are reported (E. S. R., 53, p. 486).

The practicability of the 4-knife flywheel machine was established. The table on a 4-knife machine running at 450 r. p. m. was found to travel as fast as that on a 3-knife machine at 600 r. p. m. The 4-knife machine apparently elevated as successfully as any 3-knife machine, and its general performance was smooth and very satisfactory in every respect.

Studies of the proper ratio of feed table travel to feed roll speed led to the conclusion that the speed of the table should coincide with the peripheral

velocity of the feed rolls. It was demonstrated conclusively that where the table travels slower than the feed rolls the table controls the rate of feeding almost entirely, and the feed rolls must therefore be slipping all the time. Where the entire feeding mechanism was speeded the same the feed appeared to be much more positive.

A comparison of the performances of 4- and 6-blade fans on a cylinder machine showed that, so far as power and elevation were concerned, there was practically no difference. However, the 6-blade fan made a more smoothly running machine with less vibration in the pipe. There was noticeably less rumbling and pipe vibration with the 6-blade fan, especially when the machine was suddenly slugged.

Experiments on the effect of fan wing clearance upon elevation and power requirement showed that the close fitting fan gave much the better results, especially with very green soft corn. The wide clearance fan failed to elevate even a small quantity of very green corn to a height of 37.5 ft. at 725 r. p. m. The close fitting fan elevated about one-half capacity at 400 r. p. m., and almost full capacity for the 4-knife machine at about 425 r. p. m. The results were not so striking with more mature corn, but still showed a wide margin of advantage for the close fitting fan. The difference in clearance did not have a very marked effect upon the power requirement. Using too small a pipe was found to interfere slightly with efficient elevation and increased the power requirement.

Studies of the design of the discharge housing indicated the advantage of a housing in which the axis of the pipe coincides with the axis of discharge.

Studies of air flow in silage cutter pipes led to the conclusion that the axis of discharge is not in the center of the pipe as the machines are constructed at present. The material in traveling up the pipe moves from one side to the other even in those machines which elevate efficiently. It was demonstrated that a close fitting fan at the point of discharge is essential to efficient elevation.

It is recommended that operating speeds of from 540 to 675 r. p. m. be used for 13-in. flywheel cutters, from 400 to 625 for 14-in. cutters, from 475 to 580 for 15-in. cutters, and from 440 to 550 r. p. m. for 16-in. cutters; from 500 to 600 r. p. m. for 3-knife head cylinder cutters; and from 400 to 500 r. p. m. for 4-knife head cylinder cutters. The belief is expressed that cutters smaller than 12 in. are as a general rule uneconomical to operate.

Experiments on making hay with heated air, J. Hendrick (*Scot. Jour. Agr., 9 (1926), No. 2, pp. 136–146*).—Experiments conducted at the University of Aberdeen on the use of heated air for the drying of hay are reported. Three experiments were conducted on three different stacks, and commercial drying machines were used. The temperature of the air blown into the stack varied from a little less than 100 to over 130° F.

The results were not satisfactory, and were taken to indicate that under certain conditions difficulties arise with the method of drying crops devised at Oxford University. The experiments were considered unsuccessful primarily because the stacks of hay were not fully dried. A second objection was that the consumption of fuel was very great, although the stacks were not completely dried. Even had the drying been successful the consumption of fuel would have made the process uneconomical.

Development of the electric dairy sterilizer in California, R. D. Moses (*Jour. Elect., 56 (1926), No. 9, pp. 325–328, figs. 4*).—In a contribution from the California Experiment Station data are reported which indicate that in the sterilization of dairy utensils heat conservation is of great importance, a reduc-

tion in radiation losses making possible the use of a thermostat and the increasing of the time of sterilization without added costs.

The results are taken to indicate that the ideal sterilizer is one which uses a heating element just large enough, the correct quantity of water, and insulation to the extent that a thermostat cutting out the power between 200 and 210° F. will result in a minimum consumption of electrical energy and will have a safe margin of exposure to a sterilizing temperature of 170°.

Michigan shed type poultry house, F. E. FOGLE and C. M. FERGUSON (*Mich. Agr. Col. Ext. Bul. 48 (1926), pp. 16, figs. 13*).—Shed type poultry houses adapted to Michigan conditions are described and illustrated, and working drawings and bills of material are included.

Disposal of canning factory waste, E. F. ELDRIDGE (*Canner, 62 (1926), No. 20, pp. 23–26, figs. 6*).—A brief discussion of the nature of canning factory wastes and the manner of their decomposition is presented, and data on the design of disposal systems are reported together with drawings of typical plants. It is stated that in brief a disposal plant for cannery wastes will consist of a screen followed by a tank and finally by filters.

RURAL ECONOMICS AND SOCIOLOGY

The relation between cultivated area and population, D. HALL (*Sci. Mo., 23 (1926), No. 4, pp. 356–365; abridged in Nature [London], 118 (1926), No. 2965, pp. 304–307*).—A comparison of population and area of cultivated land for Europe, except Russia, the United States, Canada, Argentina, Australia, and New Zealand shows an average of 2.4 acres cultivated per unit of population. The increase of white peoples and cultivated lands for 1870 to 1920 also shows a relation of between 2 and 2.5 acres per head. The present annual increment in white population may be estimated at 5,000,000, which would necessitate 12,000,000 acres of new lands being cultivated each year. The possibilities of increasing the area cultivated in different countries and the possible means of increasing the production per acre and of overcoming the growing disinclination of civilized people to continue in agriculture because of its small and uncertain returns as compared with those of other occupations are discussed. Intensification of production is deemed to be the only remedy to prevent the pressure of population developing suddenly or becoming unbearable.

The reclamation and settlement of land in the United States, F. L. TOMLINSON (*Internatl. Rev. Agr. Econ. [Rome], n. ser., 4 (1926), No. 2, pp. 225–272*).—The progress that has been made in the United States in the reclamation and settlement of arid, semiarid, wet, swamp, and cut-over lands is described. Special attention is given to the work under the Reclamation Act and the California Land Settlement Act of 1917, the nature of the lands in the drainage enterprises, and the future needs and policies in reclaiming and settling land.

Land planning in the United States for the city, State, and Nation, H. JAMES (*New York: The Macmillan Co., 1926, pp. XXX+427, pls. 19, figs. 57*).—This book, which is devoted chiefly to city planning and its aims and accomplishments, contains a section (pp. 15–43) on the early land policies in layout and the layouts of early settlements in the United States, and a section (pp. 313–416) on national and State planning, dealing with the past and present land policies, the needs and essentials of an adequate system of land planning for agriculture, forests, recreation areas, and other uses, the Federal and State planning agencies, land communication, and water resources.

Agricultural tenancies in England, H. REW (*Internatl. Rev. Agr. Econ. [Rome], n. ser., 4 (1926), No. 2, pp. 159–224*).—The development of land tenure and the changes in legal status of the economic relations of landlords, tenants,

and agricultural laborers are traced from the eleventh century to the present time. The provisions and workings of the more recently enacted legislation regarding tenure, small holdings and allotments, land settlement, agricultural holdings, agricultural wages, etc., are described, and existing problems and plans proposed for the future Government policy are discussed. Among the important changes pointed out are the abolishment of practically all forms of land ownership, except freehold and leasehold for years; the change of the land tenure system from one based on share tenancy or the metayer principle to one of cash tenancy; the large proportion of farms now owned by occupiers; the large amount of transference from tenancy to land ownership since the war; and the interference of the State with the freedom of contract between tenants and landlords in the interest of the former and between tenants and laborers in the interest of the latter.

Wages of farm labor as compared with cost of living, 1906 to 1925 (*U. S. Dept. Labor, Bur. Labor Statis., Mo. Labor Rev., 23 (1926), No. 3, p. 115*).—A table is given comparing the wages of farm laborers in this country and the cost of living, based on a study of retail food prices in 32 cities. From 1906 to 1912 the purchasing power of farm wages was from 0.6 per cent below to 11.8 per cent above that of 1913. During 1914 to 1918 it was 3.1 to 8.7 per cent below; in 1919 and 1920, 5.7 and 9.4 per cent, respectively, above; in 1921 and 1922, 18.2 and 15.1 per cent, respectively, below; and during 1923 to 1925, 5.1 to 7.2 per cent below that of 1913.

The marketing of farm produce.—Part I, Live-stock, F. J. Prewett (*Oxford: Clarendon Press; New York: Oxford Univ. Press, Amer. Branch, 1926, pt. 1, pp. VIII+103, pls. 6, figs. 7*).—The results are given of a study of the existing conditions in the marketing of livestock made for the Agricultural Economics Research Institute of the University of Oxford. The general situation and present-day marketing agencies, methods, and practices are described. It is pointed out that many of the present-day practices, agencies, etc., remain from the days of self-sufficing communities practically isolated by the difficult and slow means of communication, while under modern conditions of concentration of population and rapid and cheap communication, the most economical distribution system requires the use of the minimum of markets, payment for the minimum of local movements and transactions, and utilization as far as possible of direct movements from the producing to the consuming areas. The remedies suggested and discussed are a reorganization of markets into larger cooperatively owned markets for store, dairy, and breeding stock, the establishment of cooperative slaughteries and bacon factories, and the federation of the individual cooperative associations to provide mutual interest and protection and a joint purchasing and sales agency.

Methods of packing eggs and of buffing and bracing cases of eggs in carload shipments, R. R. Slocum (*U. S. Dept. Agr., Dept. Circ. 391 (1926), pp. 15, figs. 7*).—The results are given of tests made of eight methods of packing eggs and the merits of straw and hay buffing as compared with wood bracing in loading cars. Six long-distance shipments were made, each consisting of two refrigerator cars of cases loaded according to the straight-joint method, one car being buffed with straw and hay, and the other braced with wooden frames. In each car the cases of the different packs were loaded in separate rows, two cases in each row being set aside as special experimental cases and carefully examined at the time of loading and reexamined at the time of unloading to determine the number of damaged eggs and their location in the cases.

Figuring sound-shelled eggs at 32 cts. per dozen, checks and blind checks at 23 cts., and leakers at 10 cts., the average losses per case in transit ranged

from 94 cts. to $2.35, averaging $1.49, for the different packs in the straw and hay buffed cars; and from 93 cts. to $2.61, averaging $1.82, in the wood braced cars. The average losses per case in transit for the different packs were: Standard case, cup flats throughout, 94 cts.; cut down case, embossed flats, 4 excelsior pads, $1.22; standard case, 6 excelsior pads, $1.49; standard case, standard flats, ⅛-in. deeper fillers, 4 excelsior pads, $1.55; standard case, embossed flats, cup flats top and bottom, $1.62; standard case, standard flats, cup flats top and bottom, $1.88; standard case, 4 excelsior pads, $2.09; and cut down case, 4 excelsior pads, $2.46.

Sugar, T. O. Marvin et al. (*Washington: U. S. Tariff Comn., 1926, pp. VI+218, pl. 1, figs. 15*).—This report to the President upon the differences in costs of production of sugar in the United States and in Cuba, as ascertained pursuant to the provisions of the Tariff Act of 1922, includes the reports and supplemental reports of the majority and the minority of the Tariff Commission and the findings and recommendations of the commission regarding tariff changes. A statement of the President regarding the delaying of affirmative action on the report is given in the appendix.

Costs of transportation and handling of Argentine wheat, H. R. Brown and B. M. Mace, jr. (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Trade Inform. Bul. 439 (1926), pp. II+10*).—The methods and costs of transporting and handling wheat from the farm to the seaboard are discussed. An itemized summary of the costs of handling and transporting and of the charges levied on wheat exported shows the total charges from the farm to the seaboard to be 27.489 paper pesos per metric ton (31.34 cts. per bushel).

The consumers' co-operative movement in Illinois, C. E. Warne (*Chicago: Univ. Chicago Press, 1926, pp. XIV+420, fig. 1*).—A historical summary of the cooperative movements in Illinois, tracing each through its period of operation; a description of the growth of spurious cooperatives; a discussion of the problems of cooperative organization and operation and the present status of consumers' cooperation in Illinois; and an appraisal of the claims to superiority, the limitations, and the probable future of such cooperative associations are included in this work. Appendixes contain studies of the experiences of the different associations, a discussion of the status of cooperative education in America, and a specimen of the data sheet used by the author in gathering his data.

The Canadian Council of Agriculture: A review of the history and work of the national farm organization of Canada, J. W. Ward (*Winnipeg: Canad. Council Agr., 1925, pp. 31*).—The Canadian Council of Agriculture is a conference of the representatives of the affiliated provincial farmers' organizations of Quebec, Ontario, Alberta, Manitoba, and Saskatchewan for the purpose of combining their efforts in dealing with interprovincial and national problems. Its objects are (1) to encourage the organization of the farm population for the study of educational, economic, social, and political problems; (2) to be a medium for the collective activity of its members in matters of common interest; (3) to establish a bureau to collect and disseminate statistics and other information bearing on rural welfare; (4) to provide unity of action on matters of common interest and to formulate demands for legislation and present them to the Parliament of Canada; and (5) to investigate methods of taxation for providing national revenue and disseminating information thus secured through farmers' organizations. This pamphlet reviews the history and work of the council since its establishment in 1909.

The agricultural depression and proposed measures for its relief, A. M. Murphy (*Diss., Catholic Univ. Amer., Washington, D. C., 1926, pp. V+109, fig. 1*).—This dissertation, submitted in partial fulfillment of the requirements

for the degree of doctor of philosophy, reviews the causes leading up to the agricultural depression in the United States, the recommendations made in January and February, 1925, by the President's Agricultural Conference, and the farm relief bills introduced at the first session of the Sixty-ninth Congress. The principle of stabilization of farm prices and the principles of cooperation as the basis for farm relief legislation are discussed.

Rhode Island agriculture, a statistical description, R. B. CORBETT (*Rhode Island Sta. Bul. 206 (1926), pp. 4–123, figs. 73*).—The purpose of this bulletin is to present an inventory by towns (townships) of the agriculture of Rhode Island and "to furnish a source book of information concerning Rhode Island agriculture." It is based chiefly upon Federal census figures from 1850 to 1925 and State census reports of 1865, 1875, 1885, and 1895. Tables, maps, and charts with explanatory texts are given showing by townships the changes and trends in, and the present status of, rural population, use of land, number and size of farms, farm expenditures, values, mortgages, and tenure, livestock, dairy and poultry industries, gardening, field crops, and marketing and farm facilities. Index numbers are used in plotting the trend curves, thus permitting comparisons between different enterprises.

The report shows that the agriculture of the State is of a specialized type, centering around perishable products, that there has been a marked decline in the production of commodities which can be easily shipped in from large producing areas, and that there has been an increase in the production of milk and eggs and in the production of milk per cow, and the production of eggs per hen.

Report of the Agricultural Enquiry Committee [Nova Scotia], 1926, D. G. MCKENZIE ET AL. (*Halifax: Min. Pub. Works and Mines, 1926, pp. 35*).—This report contains a summary of the evidence obtained by, and the recommendations of, the committee appointed under The Public Enquiries Act of Nova Scotia to inquire into the economic conditions of the agricultural industry of the Province and to gather information to enable the Government to formulate plans and devise methods for its stabilizing and betterment.

An inquiry into British methods of crop estimating, J. A. VENN (*Econ. Jour., 36 (1926), No. 143, pp. 394–416, figs. 2*).—The origin and methods of British crop reporting are described. The official method is discussed, and the results compared with those obtained by other methods, especially with that of *The Times*. It is estimated that the official estimates are probably too low by between 5 and 10 per cent for wheat, 7 or 8 per cent for barley, 10 per cent for oats and potatoes, and from 15 to 20 per cent for root crops. The estimated yields per acre for the United Kingdom are probably affected to the extent of 2.5 bu. for wheat, 2 bu. for barley, and 3.5 bu. for oats, and the chief discrepancies appear to be in England and Wales. Certain safeguards against underestimating in the official estimates are suggested.

Live stock and animal products statistics, 1925 (*Canada Bur. Statis., Livestock and Anim. Prod. Statis., 1925, pp. 93, figs. 6; Fr. trans. pp. 85–93*).—This report is the seventh of the series previously noted (E. S. R., 54, p. 187), and consists chiefly of tables showing the production, distribution, consumption, and prices of and the foreign trade in farm livestock, poultry, and animal products for 1925, with comparisons with previous years.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

List of technical workers in the Department of Agriculture, 1926 (*U. S. Dept. Agr., Misc. Circ. 73 (1926), pp. IV+95*).—Workers in Washington and in the field service are listed by bureaus, and an index of names is given.

Vocational agriculture (*Tex. State Bd. Vocat. Ed. Bul. 203* (*1926*), *pp.* [*2*]+*41*, *figs. 19*).—General information is given regarding the requirements of the Texas State board of vocational education as to a complete program in vocational agriculture, qualifications of teachers, equipment of schools, and supervised practice or home project work under the Smith-Hughes Act. The reasons for supervised practice or home project work are set forth, and suggestions are made as to text and reference books, farm shop equipment and work, and the work of teachers during the summer months.

Vocational education in agriculture for negroes, H. O. SARGENT (*Fed. Bd. Vocat. Ed. Bul. 111* (*1926*), *pp. IX*+*92*, *figs. 9*).—The purpose of this study is to formulate a program of vocational education in agriculture designed to meet the special needs of negroes and to assist those in charge of such education to put the program into effect. The occupational, social, and school conditions, and the development and status of the training of vocational teachers of agriculture for negro schools are discussed in their relation to the formulating of a program of vocational education in agriculture for the negro schools of the South. Recommendations are made regarding the establishment and conduct of vocational schools of agriculture and the training of agricultural teachers. The report of the conference of February 13-14, 1922, on agriculture and related subjects in negro land-grant colleges is given in the appendix.

Elements of agriculture, G. F. WARREN (*New York and London: Macmillan Co., 1926, rev. ed., pp. XX*+*549*, *pl. 1*, *figs. 259*).—This is a revised and enlarged edition of a textbook previously noted (E. S. R., 21, p. 494). Chapters have been added on automobiles, trucks, and tractors, and forms of business organization.

Manual and guide for teaching farm record keeping, R. H. ROGERS (*S. Dak. Agr. Col. Ext. Circ. 252* (*1926*), *pp. 23*).—This is a manual for teachers, consisting of 30 lessons and a key to their solution, prepared for use in meeting the State requirements for practical work in farm accounts in arithmetic in the eighth grade.

Supervised practice in agriculture, including home projects, R. D. MALTBY (*Fed. Bd. Vocat. Ed. Bul. 112* (*1926*), *pp. VII*+*56*).—This bulletin, prepared under the direction of C. H. Lane, is a revision of Bulletin 83, Supervised Practice in Agriculture, and the bulletin previously noted (E. S. R., 40, p. 295) on The Home Project as a Phase of Vocational Agricultural Education. It interprets the national vocational education act as it relates to directed or supervised practice activities and discusses the means through which the provisions of the act may be carried out. The aims and values of supervised practice and the responsibilities of pupils, teachers, State administrators, and local boards of education are discussed.

The commerce of agriculture, F. A. BUECHEL (*New York: John Wiley & Sons; London: Chapman & Hall, 1926, pp. IX*+*439*, *figs. 100*).—This textbook is intended for use in a general course in agricultural economics. It is divided into four parts covering (1) land supply in relation to population pressure, (2) the physical bases of agricultural production, (3) the world's distribution of commercial crops and animal production and their broad economic significance, and (4) trade in agricultural products.

Food study for high schools, M. T. WELLMAN (*Boston: Little, Brown & Co., 1926, pp. XIX*+*528*, *figs. 79*).—This textbook in home economics presents the material selected from that previously noted (E. S. R., 37, p. 396) in the light of recent developments. The material has been presented more simply, home practice planned for, the choice of food for health given more prominence, and calorie work and meal-planning emphasized. Tables of the vitamin and min-

eral contents of foods have been added, the tables of height, weight, and food standards have been brought up to date, and a table of calories from servings has replaced the table of 100-calorie portions.

Manual of household work and management, A. BUTTERWORTH (*London and New York: Longmans, Green & Co., 1926, 4. ed., rev. and enl., pp. XVI+248, figs. 13*).—This is a manual or handy book of reference for the use of students and housewives covering the details of household work and management.

FOODS—HUMAN NUTRITION

The phytin content of foodstuffs, H. P. AVERILL and C. G. KING (*Jour. Amer. Chem. Soc., 48 (1926), No. 3, pp. 724–728*).—Data obtained by a slight modification of the method of Heubner and Stadler (E. S. R., 34, p. 10) are reported on the phytin content of 57 samples of foodstuffs including barley, buckwheat, oats, rye, wheat, hemp, millet, and rape seeds, soy beans, almonds, Brazil nuts, filberts, hickory nuts, pecans, peanuts, and English and black walnuts. The paper also includes the report of a brief study of possible losses during the purification of phytin by the method of Anderson (E. S. R., 31, p. 707) and during the preliminary treatment of foodstuffs before the estimation of phytin. Heating, soaking, and steaming were found to bring about an appreciable loss of phytin.

Nutritive value of fish and shellfish (*U. S. Dept. Com., Bur. Fisheries Doc. 1000 (1926), pp. [1]+501–552*).—Present knowledge concerning the composition and food value of fish and shellfish has been summarized by various contributors as follows: Chemical Composition of Fish and Shellfish, by E. D. Clark and R. W. Clough; Fish and Shellfish as a Source of Protein, by D. K. Tressler; Oils and Fats from Fish and Shellfish, by A. D. Holmes; Mineral Constituents of Fish and Shellfish, by H. F. Taylor; and Vitamins in Fish and Shellfish, by E. V. McCollum. A bibliography grouped by subjects is appended.

Can corrosion and blackening in certain marine products, D. B. DILL and P. B. CLARK (*Indus. and Engin. Chem., 18 (1926), No. 6, pp. 560–563*).—An extensive investigation of possible causes of corrosion of the containers and blackening of the flesh of canned crustacea is reported, with the conclusion that free oxygen and volatile bases are not involved in either change, and that the content of sulfide sulfur is an important factor in the blackening process and the H-ion concentration in the corrosion. The sulfide sulfur content of marine products which do not blacken was found to be small and not to increase during storage, and that of the crustacea which blackened to be high and to increase during storage. At an alkalinity beyond pH 6.5, corrosion took place, but there was no blackening and in general no corrosion in the case of marine products more acid than pH 6.5. Since both blackening and corrosion are more rapid at high temperatures, it is suggested that crustacean packs be stored at as low a temperature as possible and that storage below the freezing point may be economical under some conditions.

Curing meat in North Carolina, E. H. HOSTETLER and L. H. MCKAY (*North Carolina Sta. Bul. 249 (1926), pp. 10–17, figs. 5*).—Studies are reported of the shrinkage of various cuts of pork when cured by the dry as compared with the wet method, of the relative shrinkage of different cuts, and of the extent of shrinkage on curing with wood smoke as compared with liquid smoke. The effect of feed on the shrinkage of meat in cure is noted on page 866. In the 8 trials made, 86 hogs were used and a total of 516 pieces cured.

The percentage loss or shrinkage in all cases was greater with the dry salt cure than with the brine cure, the average losses being 20 and 18.3 per cent.

Of the three cuts commonly cured, the bacon sides shrank least, the hams next, and the shoulders most, the average losses in curing and storage being 15 per cent, between 21 and 22 per cent, and 23 per cent, respectively. It is noted that these losses are somewhat lower than under average farm conditions because the meat was well wrapped in paper and sacked immediately after curing and smoking, and because the curing period was shorter than on many farms. There was no appreciable difference in shrinkage with the two types of smoking.

Directions for cutting bacon sides are given, together with practical hints for the prevention of bone souring, rancidity, saltiness, excessive shrinkage, insect infection, and trouble from rats in curing and storage.

A further study of butter, fresh beef, and yeast as pellagra preventives, with consideration of the relation of factor P–P of pellagra (and black tongue of dogs) to vitamin B, J. Goldberger, G. A. Wheeler, R. D. Lillie, and L. M. Rogers (*Pub. Health Rpts. [U. S.], 41 (1926), No. 8, pp. 297–318, figs. 5*).—Continuing the study of pellagra preventives (E. S. R., 53, p. 662), the authors have reinvestigated butter, fresh beef, and yeast as sources of the pellagra-preventing factor which they designate as P–P, with results confirming their earlier conclusions that butter contains inappreciable and fresh beef and yeast appreciable amounts of this factor.

The butter used was a Vermont product previously reported by Underhill and Mendel to be effective in the treatment and prevention of black tongue in dogs, but in the present study proved to be quite ineffective in this disease, as well as in pellagra. The fresh beef was given in amounts of 200 gm. daily as a supplement to the ordinary diet to 26 pellagrins under preventive treatment. None of these showed any recurrence of the disease, although 21 were under observation for a year. Some, however, developed symptoms of beriberi which were checked by increasing the allowance of whole maize meal and cowpeas and decreasing that of grits and rice in the basal diet.

In the yeast experiments a solution of 15 gm. of Yeast Vitamin Harris Powder was given as a daily supplement to 22 patients on a basic diet identical with that of the patients receiving beef, with equally favorable results. Active symptoms of pellagra disappeared, and there was no recurrence during the treatment. Again some of the patients developed beriberi, which disappeared with the change in the basal diet noted above.

In a further study of the pellagra-preventing factor, which is assumed to be identical with the factor preventing black tongue in dogs, feeding experiments were conducted on rats to determine the relationship of P–P to vitamin B in its growth-promoting as distinct from its antineuritic properties. Autoclaved yeast, known to be active as a pellagra-preventing factor, was incapable of preventing rapid loss in weight when fed to young rats as the sole source of vitamin B to the extent of 30 or 40 per cent of the diet. An alcoholic extract of corn meal in the same amounts was also without effect in preventing rapid loss in weight, but a combination of 8 or 10 per cent of the autoclaved yeast and as little as 5 per cent of the extract of corn meal brought about resumption of growth. Fresh lean beef behaved similarly to yeast.

The authors conclude "that the antineuritic factor (vitamin B sensu stricto) is distinct from the factor P–P and does not in itself suffice for the growth of the rat; second, that if the term 'water soluble B' includes, as some investigators have suggested, in addition to the antineuritic factor a so-called growth-promoting essential (possibly identical with Wildiers' bios), this, like the antineuritic factor, is either inactivated by autoclaving or does not suffice by itself for the growth of the rat; third, that factor P–P or some associated, and, in yeast, like P–P, thermostable factor (possibly the so-called growth-promoting

factor) distinct from the antineuritic vitamin, though not sufficing in itself for the growth of the rat, is, in combination with the antineuritic, essential for growth in rats. Whether factor P-P is, as at present seems most probable, identical with the so-called growth-promoting essential heretofore included (with the antineuritic) in the term 'water-soluble vitamin B,' or whether these are distinct, further investigation must determine."

Some nutrition experiments with brewers' yeast, with especial reference to its value in supplementing certain deficiencies in experimental rations, M. I. SMITH and E. G. HENDRICK (*Pub. Health Rpts. [U. S.], 41 (1926), No. 6, pp. 201-207, figs. 2*).—Evidence is presented that dried brewers' yeast contains some factor essential in nutrition other than vitamin B. The main points of the evidence are as follows:

A ration in which the oat kernel, known to be rich in vitamin B, furnished all the protein and which contained inorganic salts and vitamin A failed to produce normal growth in young rats. Neither casein nor gelatin supplemented the deficiency, but the addition to the ration of dried brewers' yeast in amounts of 5 or 6 per cent brought about normal growth even when the yeast had previously been autoclaved to destroy vitamin B. Yeast protein alone was without effect. Young rats fed a diet in which purified casein was the sole protein and Seidell's vitamin B picrate the sole source of vitamin B showed no gain in weight until 5 per cent of autoclaved yeast was added to the diet, after which the gain in weight was rapid. Autoclaved yeast without the vitamin B picrate brought about no growth response. This is thought to indicate that casein, as well as oats, is lacking in the hitherto unrecognized factor.

Rats which had been allowed to decline in weight through the omission of yeast from a synthetic diet showed approximately the same growth response when 2.5 and 5 mg. of yeast vitamin fraction was fed, together with 500 mg. of autoclaved yeast, as with 200 and 500 mg., respectively, of whole dried brewers' yeast. The yeast vitamin fraction without the autoclaved yeast promoted fair growth when given in doses of over 15 mg. daily, showing that some of the heat-stable factor in the yeast is carried along with the vitamin B factor.

The anti-rachitic value of fresh spinach, H. CHICK and M. H. ROSCOE (*Biochem. Jour., 20 (1926), No. 1, pp. 137-152*).—This study differs from previous work on the same subject by McClendon and Shuck (E. S. R., 50, p. 263), Goldblatt and Zilva, and Zucker and Barnett (E. S. R., 50, p. 771) in that the basal diet employed was not deficient in phosphorus but only in fat-soluble vitamins.

Fresh leaves of prickly seeded spinach grown in the open in winter, spring, midsummer, and autumn were used as the sources of vitamins A and B. In most of the experiments litter controls received cod-liver oil or irradiation with ultra-violet light or a ration of irradiated spinach. All of the animals except those receiving irradiation were kept in a poorly lighted laboratory screened from direct daylight. The spinach was fed in 0.1, 0.5, and 1 gm. amounts daily for 50 days, after which the animals were killed for histological examinations of the rib junctions and analyses for calcium and phosphorus of the femur, tibia, and fibula.

The results obtained confirmed those of earlier workers in showing that in general spinach has no antirachitic properties. Spinach grown in the open in midsummer proved, however, to have a slight but appreciable antirachitic value, and irradiated spinach was strongly antirachitic.

In discussing the marked difference in the effect of sunlight and of artificial irradiation upon spinach and green leaves in general the authors state that "there is no obvious explanation for this discrepancy between the effect of

direct sunlight and of artificial ultra-violet radiation. The difference may be one of degree or there may be a rapid removal or destruction of newly formed antirachitic substance in the leaves while these are attached to the living plant. It is also possible that the failure to demonstrate antirachitic properties in naturally illuminated spinach may be due partly to their disproportionate content of vitamin A."

The question is raised as to the origin of the antirachitic vitamin in nature, particularly in the livers of cod and other fish which, living at a depth below the surface of the water, receive only a small fraction of the total ultra-violet radiation of the sun. The vitamin A content of these organs has been traced by various workers to green algae, but since these are of vegetable nature a similar synthesis of antirachitic vitamin is not to be expected.

The paper closes with a note by V. Korenchevsky on the criteria adopted for the diagnosis of rickets, based upon histological examination.

The anti-rachitic value of winter spinach, M. A. Boas (*Biochem. Jour., 20 (1926), No. 1, pp. 153–165, figs. 3*).—The investigation noted above has been supplemented by a study of the calcium and phosphorus retention of young rats on the basal diet, the basal diet supplemented with cod-liver oil, and the basal diet supplemented with fresh green leaves of winter-grown spinach, the amount of which was increased from 1 gm. up to 5 gm. daily at the end of 2 weeks and kept at this level throughout the experiment, which included a preliminary period of 2 weeks and 3 experimental periods of 2 weeks each. In a second series of experiments, the animals were given the basal diet alone for several weeks, followed by the basal diet supplemented by the spinach ad libitum.

Both cod-liver oil and spinach brought about improvement in the general health and increase in the rate of growth of the rats. This was more marked in the rats fed spinach than in those receiving cod-liver oil. The latter, however, showed an increase in the amount of calcium retained in the skeleton per unit increase in body weight, which was not shown in the spinach-fed animals. It is concluded that winter spinach contains a negligible amount of vitamin D in comparison with its content of vitamin A. The results obtained in the second series of experiments confirmed those of the first, but are not as conclusive owing to the fact that the animals used were from stock which had received egg yolk and were thus born with too great a reserve of vitamin D, as noted in the above paper by Chick and Roscoe.

The distribution of calcium and phosphorus excretion in the feces and urine in the above experiment was also determined. In all cases from 95 to 99 per cent of the total calcium excreted was found in the feces. On the basal diet alone an average of 45 per cent of the total phosphorus was excreted in the feces. The addition of both cod-liver oil and spinach caused a decrease in the amount excreted in the feces and a corresponding increase in that in the urine, which was slightly greater in the spinach than in the cod-liver oil experiment.

In commenting upon these results, the author states that, "it is perhaps dangerous to draw definite conclusions from the results of three metabolism experiments in which only 14 rats were involved, but the results obtained offer some evidence against the theory that the antirachitic factor promotes calcification by lowering the pH of the intestine. Two substances, cod-liver oil and spinach, have both been shown to favor the absorption of P as indicated by a relative decrease in the amount of P excreted in the feces. Cod-liver oil is a rich source of vitamin D, but spinach has been shown to contain only negligible quantities of this factor. It follows, therefore, that although a substance may be able to divert P from feces to urine, there is no ground for assuming that it necessarily possesses antirachitic power."

Sources of error in the technique employed for the biological assay of fat-soluble vitamins, H. Chick (*Biochem. Jour., 20 (1926), No. 1, pp. 119–130, fig. 1*).—Following a brief discussion of the interrelationship between vitamins A and D with reference to the validity of earlier work on vitamin A before its nonidentity with vitamin D had been established, an investigation is reported of the cause of irregularities in the growth behavior of young rats placed on diets deprived of fat-soluble vitamins.

A detailed examination of the technique employed indicated that these irregularities could not be traced to the degree of illumination of the animals nor to alterations in the constituents of the diets used. The trouble was finally traced to variations in the breeding stock and state of nutrition of the animals themselves when placed upon the experimental diet. The diet of the breeding stock was found to be moderately rich in vitamin A, but comparatively poor in vitamin D, except in the summer, when the milk used was conceivably much richer in vitamin D. To overcome this difference, the females of the breeding stock were provided after the birth of the young with a uniform dried milk prepared at one time from winter milk. With this change in the diet, the young animals were much more uniform in growth behavior than previously. Another cause of variation in weight was traced to the consumption by the breeding stock during the previous winter of large amounts of egg yolk, a substance known to be rich in vitamin D as well as A. The young of this stock grew normally for several weeks and developed well-calcified bones on a diet deficient in fat-soluble vitamins.

It is concluded that an important source of error in the biological method of estimating vitamins A and D lies in the variations in reserve of these vitamins in the experimental animals, depending upon the breeding stock, and that in the diets ordinarily used these variations are apt to be greater for vitamin D than A. It is recommended that egg yolk and cod-liver oil be avoided and summer or pasture-fed milk be used sparingly in such diets.

Maintenance of a standardised breed of young rats for work upon fat-soluble vitamins, with particular reference to the endowment of the offspring, H. H. Smith and H. Chick (*Biochem. Jour., 20 (1926), No. 1, pp. 131–136*).—This paper supplements the above by a description of the diets and general management of the breeding rats used by the authors for work on fat-soluble vitamins.

The diet found most satisfactory consists of cow's milk, brown or white bread, or whole cereals, with fresh raw carrots, turnips, cabbage, or spinach. Marmite is given daily mixed with the food, and raw lean meat is given twice a week, except during the last few days of pregnancy and the period of lactation, when the meat is usually omitted. Following the discovery noted in the previous paper that the young of animals receiving summer milk are born with a greater reserve of vitamin D, dried winter milk is now substituted for fresh milk for the females during the last days of pregnancy and the period of lactation.

The phosphorus content of the body in relation to age, growth, and food, H. C. Sherman and E. J. Quinn (*Jour. Biol. Chem., 67 (1926), No. 3, pp. 667–677, figs. 2*).—Following the same general procedure as in the previously noted investigation by Sherman and MacLeod of the calcium content of the body in relation to age, growth, and food (E. S. R., 54, p. 593), the authors have made a similar study of the phosphorus content. The Official gravimetric method was used for the phosphorus determinations.

In general the variations in the phosphorus content were similar to those previously reported for calcium. The average percentage of phosphorus in the

body of the normal white rat increased from 0.34 per cent at birth to about 0.49 per cent at 15 days, from 0.53 to 0.56 per cent at 28 days, from 0.57 to 0.65 per cent at 61 days, from 0.62 to 0.68 per cent at 3 months, from 0.65 to 0.69 per cent at 4 months, and from 0.7 to 0.75 per cent in adult life. From the age of 15 days on, the total weight of phosphorus averaged higher for the males than the females on account of the greater average body weights of the males. Females which had not borne young had higher percentages of phosphorus than males of the same age and inheritance and of the same dietary history. Females which had borne and suckled young had lower percentages of phosphorus than those which had not raised young, but showed a tendency after lactation had ceased to regain some of the lost phosphorus.

On a diet low in calcium the phosphorus content was low, as well as the calcium noted previously. The addition of calcium lactate increased and that of cod-liver oil had no effect upon the phosphorus content.

A comparison of the relative gains in body weight and weights of calcium and phosphorus in the body from birth to middle age has been calculated in terms of birth values of unity from the reported data and reproduced graphically. These show that the body phosphorus increases in greater ratio than the body weight but at a much smaller ratio than the body calcium. The average adult male is estimated to have 70 times the body weight with which it was born, 150 times as much phosphorus, and 340 times as much calcium.

Normal variations of the inorganic phosphate of blood, R. E. Havard and G. A. Reay (*Biochem. Jour., 19 (1925), No. 6, pp. 882–887, figs. 3*).—Using a micro modification of the Briggs method (E. S. R., 48, p. 111) requiring only 0.5 cc. of blood, the authors have studied the normal variations in the phosphate content of the blood of the same subject under varied conditions and the seasonal variations with several subjects.

Exercise, even ordinary walking about the laboratory, was found to increase the amount of inorganic phosphorus considerably over the level at rest. More irregular results were obtained in the afternoon than in the morning. Morning determinations after a period of rest are consequently recommended for reliable results.

In an experiment continuing for 30 hours, during which the subject did not exercise at all, the average day level was 3.56 mg. of phosphorus per 100 cc. of blood and the sleep level 5.06 mg., or an increase of 42 per cent. On reversing the usual custom by sleeping during the day and keeping awake at night, there was an increase during the sleep period of 19 per cent. In both experiments the phosphorus fell repidly to the lower level after the subject awoke. Seasonal variations were obtained, the lowest values, an average of 2.9 mg. per 100 cc., occurring in January and the highest, 4 mg., in August. The increase is attributed to the greater intensity of ultra-violet rays in summer.

Magnesium metabolism on purified diets, G. Medes (*Jour. Biol. Chem., 68 (1926), No. 2, pp. 295–316*).—A smoothed curve prepared from the results obtained from the analyses of rats from the same litter killed at various ages showed that a male rat weighing 48 gm. at 29 days contains 0.7 per cent calcium, 0.53 per cent phosphorus, and 0.46 per cent magnesium and a female weighing 36 gm. at 29 days 0.74 per cent calcium, 0.58 per cent phosphorus, and 0.046 per cent magnesium. Corresponding figures for male rats weighing 135 gm. at 57 days are 0.79, 0.58, and 0.38 per cent, respectively, and for females weighing 122 gm. 0.84, 0.61, and 0.39 per cent, respectively.

In simple inanition the percentage of calcium and phosphorus was found to increase and that of magnesium to remain approximately constant. On de-

creasing the amount of calcium in the diet growth was inhibited, the percentage of calcium was decreased, the phosphorus was unchanged, and the magnesium was decreased. On increasing the calcium of the diet there was an increase in the calcium and phosphorus and a slight decrease in the magnesium content of the body. On decreasing the phosphorus of the diet the percentages of phosphorus, calcium, and magnesium were decreased. With an increase in phosphorus normal values were obtained. On a low magnesium diet the percentage of magnesium in the body decreased slightly and of calcium and phosphorus tended to increase. On a high magnesium diet there was a slight increase in the percentage of magnesinm and no change in the other two elements.

These variations in the ratios of calcium, phosphorus, and magnesium did not result in abnormalities in the rats except when the amonnt of phosphorus was low, in which case rickets resulted.

Diet and disease, with special reference to the teeth, lungs, and prenatal feeding, E. MELLANBY (*Brit. Med. Jour., No. 3403 (1926), pp. 515–519, pls. 2, fig. 1*).—In this British Medical Association lecture, laboratory and clinical experience is reviewed illustrating the view that the diet of the people of England is defective in that it includes too little of the substances which contain fat-soluble vitamins and relatively too much cereal. The various topics considered are (1) the effect of these defects on the teeth, (2) the influence of the maternal diet during pregnancy on the suceptibility of the offspring to disease, (3) the relation of diet to susceptibility to infections of the respiratory tract, and (4) the possible bearing of topics 2 and 3 on catarrhal conditions in children.

The basal metabolism of girls, K. BLUNT, J. TILT, L. MCLAUGHLIN, and K. B. GUNN (*Jour. Biol. Chem., 67 (1926), No. 2, pp. 491–503*).—Data are reported and discussed on the basal metabolism of 46 girls varying in age from 8 to 18 years. On 22 of the girls the determination was repeated a second year and on 15 a third year. The observations at each of the ages between 9 and 13 were made on from 10 to 18 girls, and these observations were used for the setting up of tentative standards and comparisons with other standards.

The most noticeable features of the average results for this age group are summarized as "the steady increase in total calories with age, from 1,084 to 1,437; the almost eqnally regular decrease of calories per kilogram, from 37 to 30; and the much slighter and somewhat irregular differences in the calories per square meter and per centimeter. It is remarkable that for these five ages the average calories per square meter vary from an average of 42.5 by only ±4 per cent; and that the average calories per centimeter vary from an average of 8.57, by only +7 and −5 per cent. Plainly height and surface have more to do with rate of metabolism than has age or weight directly."

The individual variation from the average for age was rather slight at the younger ages, but increased with age. The subjects who were 10 per cent or more underweight tended to show a high basal metabolism computed in calories per kilogram and a low or normal metabolism in terms of total calories or calories per square meter or per cubic centimeter. The opposite was true of the overweight subjects. The least variation from the average in both cases was found in calories per square meter. "Thus the girl of average build can be compared with our average for her age fairly satisfactorily by any one of our four methods of comparison, with only a slight advantage for surface or height, but the over- or underweight girl only on the basis of calories per square meter."

In comparison with other standards, the data were almost uniformly higher than the standards for girls proposed by Benedict (E. S. R., 53, p. 862) and in most cases in close agreement with those of MacLeod.[1]

TEXTILES AND CLOTHING

[Flax retting studies in Michigan], A. Trevithick (*Michigan Sta. Rpt. 1925, pp. 203–206*).—A study of pectin and a microscopical study of the organisms of retting solutions are described briefly, and the following summary reports are given of retting studies in cooperation with the U. S. Department of Agriculture.

I. *A study of aerobic spore bearing bacteria isolated from retted flax.*—The predominating organisms found on flax fiber appeared to be gram positive spore-bearing rods, although some coccus forms were also present. The subtilis, mycoides, and mesenteric-like organisms predominated. They were found to attack the common carbohydrates and most of them to attack starch. The clostridium-shaped organisms found may be the same as Rushmann's "potentially anaerobic" forms. Since these organisms attack carbohydrates and starch it seemed possible that during storage they aid in the deterioration of flax fiber and linen materials.

II. *Studies in connection with pure culture flax retting.*—Retting organisms seemed present on all normal flax straw studied. Flax straw is sterilized with difficulty because of very resistant spores thereon and the stem structure, and because the fiber bundles are held together with pectin, which hydrolyzes in the presence of heat and moisture. However, sterilization could be had by using air at 145 to 160° C. for 3 hours on 2 consecutive days. Sterilizing or heating flax straw before retting commercially is not held advisable because fibers become harsh and discolored when heated, and the natural flora on the straw which aids retting may be destroyed. Mold should be avoided by keeping the straw submerged in the retting solutions, and organic substances, coloring matter, and by-products of a previous ret should be removed to prevent retarding the next ret and discoloring the fiber. With an efficient operator the best temperature for retting is 30°; otherwise a lower temperature, 25°, which means slower retting, is desirable. After retting, the flax straw should be washed thoroughly before drying.

Spinning tests of picked and snapped cottons (Texas and Oklahoma, 1925 crop), H. H. Willis (*U. S. Dept. Agr., Bur. Agr. Econ., 1926, pp. 18, figs. 3*).—Spinning tests were made in cooperation with Clemson Agricultural College on snapped and picked cotton from the same fields in Oklahoma and Texas. Although not held conclusive, the tests indicated that snapping as a method of harvesting lowers the quality of the cotton by about two grades. With efficient boll extracting equipment, the spinning qualities of a cotton were not noticeably affected. The percentage of visible waste in snap cotton was not found materially greater than in picked cotton of equal grade. Considering these results as typical, snapping cotton at the officially quoted prices and under conditions prevailing in 1925 resulted in a loss to the grower of $7.29 a bale as compared with picking. When greater discounts were assessed against the cotton because of its being snapped and when the cotton was sold in the seed, this loss ranged from about $14 to $27 per bale.

Rayon issue (*Textile World, 70 (1926), No. 15, pp. 31–65, figs. 50*).—Among the articles embraced in these pages are Possibilities of So-Called "Staple Fiber," by W. H. Canning; Links in the European Rayon Chain; Rayon Experimental Plant and Training School, by A. G. Perl; Future of Rayon

[1] Studies of the Normal Basal Energy Requirement, G. MacLeod. Diss., Columbia Univ., New York, 1924, pp. 87, figs. 10.

Depends Upon Research, by W. F. Edwards; Progress in British Rayon Industry, by J. G. Oliver; Rayon in Woolen and Worsted Fabrics, by R. Little; Silk Trade Finds Some New Uses for Rayon, by W. A. Spafford; Conservative Rayon Use Best in Women's Wear, by W. B. Dall; Rayon Making Headway in Cotton Goods, by H. E. Fayes; Processing Cotton-Rayon Piece Goods, by W. W. Chase; Rayon in Narrow Fabrics, by M. E. Jameson; Oils and Oil Products in Rayon Processes, by H. C. Roberts; Rayon Warps in the Cotton Mill, by R. Winder; Processing Rayon Hosiery; Difficulties Encountered in Knitting Rayon, by G. R. Merrill; Silk and Rayon Combination Yarns, by F. O. Pfingst; Analysis of Rayon-Worsted Yarns; Wool and Rayon Combination Yarns, by Brompton; Rayon Underwear Fabric, by I. L. Sheldon, Jr.; and Distinguishing Viscose from Cuprammonium, by W. T. Schreiber and H. A. Hamm. Statements are also made concerning the status of the industry and the utilization of rayon.

Irregularity in the behavior of wet rayon, H. D. W. SMITH (*Textile World, 70 (1926), No. 16, pp. 75, 76, figs. 2*).—A study of rayon warp striped cotton goods and all rayon warp goods disclosed that in wet rayon of the viscose type strength and elongation are not uniform for all degrees of wetness. If the rayon yarn or fabric is thoroughly wet in water and then allowed to dry the wet material will gradually increase in strength and the elongation decrease until the material reaches a damp condition just before it feels dry to the touch. In this state elongation decreases rapidly to a value considerably below the air-dry value and then increases again to the normal air-dry value. In other words, at a certain actual water content this type of rayon becomes more brittle.

With unsized and sized rayon the behavior was somewhat similar, but the changes of the sized material were more marked in amount and rapidity. For both bleached and dyed unsized rayon the minimum elongation recorded was about two-thirds of the wet elongation, and the strength increased continuously from the wet to the dry condition. For sized material the minimum elongation dropped as low as one-half to one-quarter that of the elongation when wet. Coincident with this decreased elongation the strength dropped back to a lower value and then increased rapidly to the dry value.

Since rayon is unusually brittle when in a damp condition, it seems essential, in order to avoid the breakage of ends due to this lack of elasticity or give, that fabrics made in whole or in part of rayon be kept thoroughly wet in finish and dried with great care as to tension.

The properties of shoe leather, IV–VI (*Jour. Amer. Leather Chem. Assoc., 21 (1926), Nos. 6, pp. 294–299, figs. 2; 7, pp. 351–357, figs. 2; 8, pp. 399–403, figs. 2*).—These papers continue the series previously noted (E. S. R., 55, p. 494).

IV. *Strength, stretch, and stitch tear,* J. A. Wilson and G. Daub.—In this study the stretch of the various samples of leather has been plotted as a function of the load in kilograms per 2.54 cm. (1 in.) width and per square centimeter of cross section of the test strip. The end point of each curve is the breaking point, which is a measure of the strength of the sample.

The strength per unit width was greatest for the vegetable-tanned sole leather on account of its thickness. This leather, however, ranked only twelfth per unit area of cross section. Vegetable-tanned calf leather ranked first in strength per unit width and second per unit cross section. Kangaroo leather ranked first per unit cross section and tenth per unit width. The weakest leathers were the naturally heavy leathers which had been split down to make them thin enough for light shoe uppers, the patent side, the cordovan, and the shark leathers.

In stitch tear vegetable sole leather prove the most resistant and suede the least resistant.

V. *Area change with relative humidity*, A. J. Wilson and E. J. Kern.—*In this* study, which supplements a previously reported comparison of vegetable-tanned and chrome calf leather (E. S. R., 51, p. 614), measurements were made of the increase in area and water content with increasing relative humidity of the atmosphere of the 18 leathers used in the previous studies of the series.

Although the values of the water content and area did not follow exactly the same order, there was in all cases an increase in area with increase in relative humidity. Cordovan, vegetable sole, and vegetable calf showed the least absorption of moisture and increase in size with increased humidity and the various chrome leathers and kangaroo leather the greatest.

The authors are of the opinion that no single factor will explain all of the differences in the area changes for the different leathers and that the effect of chemical composition upon area change is worthy of more attention.

VI. *Resilience*, J. A. Wilson and E. J. Kern.—The resilience of the various leathers tested is reported in terms of the percentage rebound of a plunger dropped upon them under certain prescribed conditions.

Stain removal from fabrics: Home methods (*U. S. Dept. Agr., Farmers' Bul. 1474 (1926), pp. II+30, figs. 2*).—This revision of Farmers' Bulletin 861 (E. S. R., 38, p. 114) has been prepared by the Division of Textiles and Clothing, Bureau of Home Economics.

MISCELLANEOUS

Report on the agricultural experiment stations, 1925, E. W. ALLEN, W. H. BEAL, E. R. FLINT, ET AL. (*U. S. Dept. Agr., Off. Expt. Stas., Rpt. Agr. Expt. Stas., 1925, pp. 160*).—This report contains a discussion of the activities of the stations during the fiscal year ended June 30, 1925, noted editorially (E. S. R., 55, p. 401); a résumé entitled Some Results of Recent Station Work; three special articles noted elsewhere in this issue; a list classified by subjects of the publications of the stations received during the year; and Income, Expenditures, and other Statistics, by J. I. Schulte.

List of bulletins of the agricultural experiment stations for the calendar years 1923 and 1924, C. E. PENNINGTON (*U. S. Dept. Agr. Bul. 1199 (1926), Sup. 2, pp. 54*).—This supplements the list previously noted (E. S. R., 52, p. 97).

Semi-centennial of the Connecticut Agricultural Experiment Station, 1875–1925 (*Connecticut State Sta. Bul. 280 (1926), pp. 615–657, figs. 14*).—The addresses and other data pertaining to this celebration, which has been noted editorially (E. S. R., 53, p. 601), are here given.

General index to reports of the State entomologist of Connecticut, 1901–1925, W. E. BRITTON (*Connecticut State Sta. Bul. 281 (1926), pp. 659–710*).—Subject indexes of the reports and their illustrations are given.

Thirty-seventh Annual Report of the [Connecticut] Storrs Agricultural Experiment Station . . . 1925 (*Connecticut Storrs Sta. Rpt. 1925, pp. [4]+444, figs. 96*).—This contains the reprints of Bulletins 125–136, all of which have been previously noted.

[Annual Report of Florida Station, 1925], W. NEWELL ET AL. (*Florida Sta. Rpt. 1925, pp. 97+IV, figs. 5*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1925, notes on the work of the station during the year, and departmental reports, the experimental features of which are for the most part abstracted elsewhere in this issue.

Work and progress of the [Idaho] Agricultural Experiment Station for the year ended December 31, 1925, [E. J. IDDINGS] (*Idaho Sta. Bul. 143 (1926), pp. 26*).—This contains the organization list, a report of the director,

and financial statements for the Federal funds for the fiscal year ended June 30, 1925, and for the remaining funds for the fiscal year ended December 31, 1925. The experimental work reported is for the most part abstracted elsewhere in this issue.

[Thirty-eighth Annual Report of the Michigan Station, 1925], R. S. SHAW ET AL. (*Michigan Sta. Rpt. 1925, pp. 163–246, figs. 12*).—This contains a financial statement for the year ended June 30, 1925, and reports of the director and heads of departments on the work of the station during the year, the experimental features of which are for the most part abstracted elsewhere in this issue.

Progress of agricultural experiments: [Report of director of New Hampshire Station], 1925, [J. C. KENDALL] (*New Hampshire Sta. Bul. 221 (1926), pp. 43*).—This contains the organization list, a report of the director on the work of the station, and a financial statement for the fiscal year ended June 30, 1925. The experimental work reported is for the most part abstracted elsewhere in this issue. The text of the Purnell Act is appended.

NOTES

California University and Station.—L. J. Fletcher, head of the division of agricultural engineering, has resigned effective December 31 to accept a position with a tractor manufacturing company.

Iowa College and Station.—Blair Converse, associate professor of technical journalism, has been appointed head of the department vice F. W. Beckman, whose resignation has been previously noted.

Massachusetts College and Station.—Rollin H. Barrett, who has been taking graduate work at Cornell University, has been appointed assistant professor of farm management beginning December 1, succeeding Max F. Abell, resigned. Ronald L. Mighell, a graduate student at the University of Minnesota, has been appointed investigator in farm management in connection with Purnell projects.

Missouri University.—A new feature of Farmers' Week, to be held from January 17 to 21, 1927, in cooperation with 14 State associations of farmers and home makers, is the scheduling of five general meetings to be opened with group singing and devoted chiefly to addresses by widely known speakers. Another new feature is a series of exhibits by the home economics department for mothers of farm children. There are also to be ten short courses offering specialized information on phases of farm and home management.

Porto Rico Station.—Dr. H. L. Van Volkenberg, formerly connected with the U. S. D. A. Bureau of Biological Survey and the Bureau of Fisheries, U. S. Department of Commerce, has been appointed associate parasitologist.

Wisconsin University and Station.—E. H. Farrington, chairman of the department of dairy husbandry, has retired from active service with the title of professor emeritus after 32 years' service. Originally appointed in 1894 associate professor of dairy husbandry, he was made the first head of the department in 1900. During this period there has been a great physical growth of the dairy department and a marked development of the entire field, to which he himself has contributed such important processes as the alkaline tablet test for acidity of dairy products, the high pressure oven test for water in dairy products, the milk sediment test, and the Farrington butter test for fat content.

Dr. Ira L. Baldwin, who received the Ph. D. degree in bacteriology from the university last summer, has been appointed assistant professor of bacteriology, effective February 1, 1927. He will take up the legume culture work formerly conducted by Dr. A. L. Whiting, whose resignation has been previously noted.

Experimental Rabbit Station.—Arrangements are being completed to open a rabbit experimental station at Ontario, Calif., on the grounds of the Chaffee Union High School. The use of a tract of 5 acres of land with the necessary fencing and water is to be given the U. S. Department of Agriculture for the purpose, and it is expected that $15,000 will be raised by the National Rabbit Federation to erect the necessary buildings and other improvements and provide the running expenses for at least one year. The purposes of the station will be the study of the economic production of rabbits for meat and fur, breeding and feeding methods, diseases and parasites, and the utilization of rabbit offal and manure as fertilizer. It is hoped to begin the construction of buildings immediately and to open the station by March 1, 1927, with D. Monroe Green of the Bureau of Biological Survey in charge.

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